R9200-7

TRAFFIC (U.S.A.)

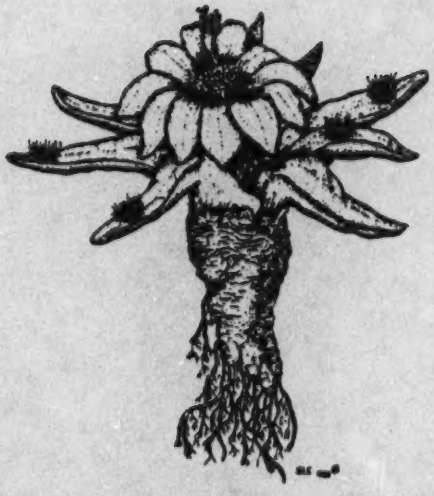
WORLD WILDLIFE FUND-U.S.

International Trade in Plants

Focus on U.S. Exports and Imports

by

Thomas Gibson
Niall McCarten
Faith Campbell, Ph.D.
Linda McMahon, Ph.D.



SPECIAL REPORT 4

This report was funded by the Rare Animal Relief Effort (RARE), the World Wildlife Fund-U.S., the Natural Resources Defense Council, and TRAFFIC (U.S.A.).

RARE

NATURAL RESOURCES DEFENSE COUNCIL

International Trade in Plants

Focus on U.S. Exports and Imports

by

Thomas Gibson
Niall McCarten
Faith Camptbell, Ph.D.
Linda McMahan, Ph.D.

December, 1981

Copyright © 1981
TRAFFIC (U.S.A.)

TRAFFIC(U.S.A.) - Trade Records Analysis of Flora and Fauna in Commerce - is a Specialist Group of the Species Survival Commission of the International Union for Conservation of Nature and Natural Resources. Its function is to monitor the international trade in wildlife and plants. TRAFFIC(U.S.A.) is funded by World Wildlife Fund-U.S.

Acknowledgements

The authors would like to thank the many people who helped in preparing this report, including those who provided information and comment.

The first thanks is to the Rare Animal Relief Effort (RARE), the organization funding the initial effort and to Dr. Gerald A. Lieberman, Executive Director of RARE for providing valuable comment during the preparation of the report.

Numerous people reviewed various drafts and provided comment. These people include Grenville Lucas, Sara Oldfield, and Hugh Synge of the Threatened Plant Committee; Dr. Edward Ayensu and Dr. Robert DeFilipps of the Smithsonian Institution; Joseph Dowhan of the U. S. Fish and Wildlife Service, Roger McManus, presently with the Center for Environmental Education, and Calloway Dodson of the Marie Selby Botanical Gardens. Others assisted in helping to locate and compile the data presented here. We are indebted to: the staff of the International Convention Advisory Commission (ICAC), including Gordon Brown; Paul Gertler of the U. S. Fish and Wildlife Serivce; Thomas McIntyre of the Animal and Plant Health Inspection Service at USDA; Gail Munro and Jane Lamlein of the Smithsonian Institution; and Susan Edwards, who provided us with the illustrations for this report; and Robert Sutter, botanist in the North Carolina Department of Agriculture who provided information on the status of the Venus flytrap. We also wish to thank Ann Daniells, Anne Garnett, and Susan Vogel, who helped type the revisions of this report.

Special thanks to Dr. Nicole Duplaix and David Mack of TRAFFIC (U.S.A.) who provided encouragement and numerous helpful comments during the preparation of this report.

Abstract

Trade in house and garden plants, including trade in rare species, has been occurring for centuries. Recently, however, there has been a dramatic increase in the plant trade, including species protected by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), especially orchids, cacti and other succulents, cycads, and insectivorous plants. Imports of CITES-protected plants into the United States in the late 1970's approached an estimated 10 million plants. In the United States, CITES is implemented by the U.S. Fish and Wildlife Service, Department of the Interior, and by the Animal and Plant Health Inspection Service (APHIS), U.S. Department of Agriculture. Several problems emerge from an analysis of the data included in this report. First of all, there is little information available on how many plants in trade are wild-collected specimens and how many are artificially propagated. Incomplete and erroneous identification of plants in trade and inconsistencies in reporting by CITES Parties is also evident. Illegal activities in the plant trade are still occurring, and many loopholes exist for circumventing CITES, the U.S. Endangered Species Act, and conservation laws of the various states. We recommend that CITES Parties increase their efforts to accurately and completely report their plant exports and imports and to increase protection of their native rare plants. We further recommend that special projects be initiated to study and monitor trade in CITES plant species, to determine the extent of collection of rare species from wild populations, and to compile domestic legislation of the U.S. and other countries.

Recommendations

1. Problem: Data presented in the CITES Annual Reports for Party Countries is inadequate to fully evaluate international plant trade in protected species. Many Parties do not prepare reports at all, others do not report plant trade, and existing reports are often contradictory and incomplete.

Recommendation: CITES Parties should increase their efforts to monitor and report plant trade. Trade should be identified in the most detail possible, including species, and where applicable, subspecies or variety.

2. Problem: Little information is readily available concerning which species most commonly are propagated artificially.

Recommendation: Special study reports are needed to determine the extent of trade in certain plant groups and species and to disseminate information on ease and extent of artificial propagation. In conjuction with this effort, botanical institutions should initiate programs to study the propagation of rare plant species.

3. Problem: Many rare plant species in trade are presently not listed on CITES Appendix I.

Recommendation: Parties should draft proposals to include native rare plant on the CITES Appendices. This would be particularly appropriate where sufficient information already exists on species abundance and distribution, including, for instance, the 21 species of cacti presently listed as endangered or threatened on the U.S. Endangered Species List.

4. Problem: Little information is readily available concerning the domestic legislation of many countries that prohibit or control plant trade.

Recommendation: Research projects should be initiated to identify and compile plant conservation laws worldwide that specifically regulate or prohibit plant trade, including laws protecting named plant species.

Table of Contents

	Page
Acknowledgements	i
Abstract	ii
Recommendations	iii
Table of Contents	iv
List of Tables and Figures	v
I. Introduction	1
II. The Major Plant Groups in Trade	4
A. Orchids	4
B. Cacti and Other Succulents	4
C. Cycads	6
D. Insectivorous Plants	9
III. The Plant Trade	17
A. Sources of Data	17
B. Trade Statistics	18
C. Data Problems and Inconsistencies	21
IV. Legislation and Enforcement	73
A. U.S. Legislation and Enforcement	73
B. Rationale for Legislation and Enforcement	75
C. Enforcement Problems	82
V. A View from Inside the Plant Trade	95
References	viii
Appendix A. The Artificial Propagation Exemption	xii
Appendix B. List of Major Plant Societies Worldwide	xxi
Appendix C. Authors' Note	xxiv

List of Tables and Figures

Tables

		Page
1.	Number of Societies Specializing in Plant Groups in Trade.	3
2.	Orchid Species Most Often Traded in 1970 and 1979 (in Order of Frequency).	11
3.	Cactus Species Reported as Most Heavily Traded as U.S. Exports, 1977-1979.	12
4.	Selected Genera of Succulents Other Than Cacti Common in Trade.	14
5.	Cycads Reported as U.S. Imports or Exports, 1977-1979.	15
6.	Insectivorous Plants Listed on the CITES Appendices.	16
7.	Live Plants, Flower Seeds, and Orchids Imported into the United States, 1947-1980.	23
8.	Numbers of Countries Exporting Several Classes of Plants to the United States, 1947-1980.	26
9.	Value of Several Categories of Plants Imported to the United States, 1955-1980, Reported and Constant (1980) Dollars	28
10.	Wholesale Value of Tropical Foliage Plants Purchased in the U.S., 1959-1976	31
11.	U.S. Imports of Cacti and Succulents, Orchids, and Cycads, showing Major Supplying Regions.	32
12.	Kilograms of Brazilian Orchid Exports, 1974 to 1977.	34
13.	U.S. Orchid Imports by Country, 1947-1980.	36
14.	Number of Orchids Exported to the United States from Other Countries. Totals and Percentages of the Trade for ten-year periods of 1971 through 1980 and 1951 through 1960.	44
15.	Price (U.S. Dollars) of Orchid Imports into the United States, 1955-1980, Value as Declared and Declared Value in Constant (1980) Dollars.	46
16.	Percent of Species versus Hybrids Illustrated in the American Orchid Society Bulletin.	48
17.	U.S. Cactus and Succulent Imports through Fourteen Ports of Entry.	49

18. Monthly Summaries of U.S. Imports of Cacti and Succulents through the Five Major Ports of Entry. 50

19. Breakdown of Countries Supplying Cacti and Succulents to the United States, October 1977 to September 1978. 52

20. Reported Exports and Imports of Cacti, 1977-1979, Identification to Family, Genus, or Species. 53

21. Approximate Number of CITES-listed Plants Reported as Exports, 1977-1979, Listed by Family. 54

22. U.S. Orchid Imports for 1978. Comparison of CITES and Customs Service Data. 55

23. U.S. Orchid Imports for 1979. Comparison of CITES, APHIS, and Customs Service Data. 56

24. Volume of CITES-Listed Plants Exported in 1978 Compared with Those Listed as Imports in Other Countries' CITES Reports. 57

25. Volume of CITES-Listed Plants Exported in 1979 Compared with Those Listed as Imports in Other Countries' CITES Reports. 61

26. Volume of CITES-Listed Plants Imported in 1978 Compared with Those Listed as Exports in Other Countries' CITES Reports. 67

27. Volume of CITES-Listed Plants Imported in 1979 Compared with Those Listed as Exports in Other Countries' CITES Reports. 70

28. Exports and Imports of Cactus Species Listed or Under Review for Listing under the U.S. Endangered Species Act. 85

29. Reported Trade in Rare Mexican Cacti. 86

30. Characteristics of Rare Cacti in Trade. 91

31. Rare Orchids in Trade. 93

32. Rare Plant Species Reportedly Collected from Protected Areas. 94

33. Number of Species Offered in Cactus and Succulent Nursery Catalogues for 1978-1979. 99

Figures

1. Vanda coerulea and Laelia jongheana (illustrations). 5

2. Pelecyphora strobiliformis and Ariocarpus agavoides (illustrations). 7

3. Stangeria eriopsis (illustration). 8

4. Dionaea muscipula (illustration). 10

5. Live Plants, Flower Seeds, and Orchids Imported into the United States, 1947-1980. 24
   a. Live Plants Suitable for Planting. 24
   b. Flower Seeds. 25
   c. Orchids. 25

6. Number of Countries Exporting Several Classes of Plants to the United States, 1947-1980. 27

7. Value of Several Categories of Plants Imported into the United States, 1947-1980, Reported and Constant (1980) U.S. Dollars. 29
   a. Live Plants Suitable for Planting. 29
   b. Flower Seeds. 30
   c. Orchids. 30

8. Wholesale Value of Tropical Foliage Plants Purchased in the U.S., 1959-1976, Reported and Constant (1980) U.S. Dollars. 31

9. Major Supplying Regions for U.S. Imports of Cacti and Succulents, Orchids, and Cycads. 32

10. Export of Orchids from Papua New Guinea, 1962-1977. 33

11. Brazilian Orchid Exports (in kilograms), 1974-1977. 35

12. Declared Values of U.S. Orchid Imports, 1955-1980, Reported and Constant (1980) Dollars. 47

13. Percent of Species Versus Hybrids Illustrated in the American Orchid Society Bulletin, 1950-1979. 48

14. Seasonal Variation in U.S. Imports of Cacti and Succulents through the Five Major Ports of Entry. 51

15. Increase in Reported CITES Exports from the United States, 1977-1979. 54

16. Pachypodium namaquanum (illustration). 77

17. Welwitschia bainesii (illustration). 78

18. Nepenthes rajah (illustration). 84

Chapter I

Introduction

Trade in plants is probably as old as world travel. One of the first recorded collecting expeditions was in 1570 B.C. when an Egyptian fleet traveled to Somalia to bring back seeds and plants suitable for making incense (Anderson, 1966). Soon thereafter, Egyptians acquired ornamental flowers and trees, often ones having medicinal as well as ornamental value like poppies, oleander, and water lilies (Anderson, 1966; Huxley, 1974).

By the time John Gerard wrote his famous book on herbs in the 16th century, many exotic plants had already found their way to Europe. Tulips, for example, reached Europe in the mid-16th century (Anderson 1966). Linnaeus in the 18th century apparently was familiar with many exotic plants, naming genera now common in trade like Nepenthes (pitcherplants native to Malaysia, Madagascar, and many Asian countries), and Euphorbia, a genus containing many African succulents. The pink-flowered Bletia verecunda, a terrestrial orchid native to tropical America and the West Indies, was reportedly one of the first exotic orchids to arrive in Britain in 1731 (Anderson 1966; Yearsley, 1976). Huxley (1974) reports that the British were the world's leaders in seeking out and growing exotic, ornamental plants, first seeds and bulbs that could withstand a long sea voyage, and later, individual plants collected in the tropics.

Orchids, for example, are one group of plants with a long history in the horticultural trade. During the 19th century, the commercial trade was characterized primarily by collections from native habitats. Benedict Roezl, a commercial collector in the 1800's, reportedly sent a shipment of eight tons of orchids from Central America to Europe (Whittle, 1970). Dealer's letters reported the loss of 21,000 Phalaenopsis from the Philippines and another 177 cases of orchids when their ships sank in storms (Yearsley, 1976). Nearly 40,000 specimens of Dendrobium atroviolaceum were collected from Papua, New Guinea in 1898; unfortunately, only 5,000 plants survived the voyage to England (Kores, 1977). Such massive collections from the wild have occurred in more recent years: in 1930, there was a report of a shipment of 47,000 wild plants of Vanda sanderiana (Dunsterville, 1968). Over the last 100 years, the number of people purchasing orchids has increased as less wealthy individuals took up the hobby (Yearsley, 1976; Fordyce, 1979); however, many choice specimens, wild or artificially propagated, still command high prices. Recently, a specimen of Phalaenopsis violacea was offerred in a trade journal for $30,000 (Am. Orch. Soc. Bull. 50(5):601, 1981).

Some other plant groups have a shorter trade history. While a few species of Mexican cacti were sent to Europe about 1840 where they were sold for high prices, (Britton and Rose, 1963), larger quantities of cacti were not commonly exported until recently. Insectivorous plants became a sensation in the horticultural trade in the late 1800's. By mid-1880, 46 species of Nepenthes pitcherplants were being exported commercially

from Malaysia and East India to Europe and the United States (Whittle, 1970). Also, Sarracenia pitcherplants were popular among the Victorians (Bell, 1952).

The recent growth in the number of plant societies everywhere further documents the increased popularity of plants during the last few centuries. There are approximately 170 organizations specializing in orchids, cacti, palms, cycads, insectivorous plants, ferns, succulents, and other horticultural plants (Table 1; Appendix B). Orchid societies alone total 73, while cactus and succulent groups include another 22. Many of these organizations were founded in the late 19th or early 20th century; but many also have been formed since 1970. Based upon a recent survey, authors Gibson and McCarten estimated that membership in these organizations numbers included at least 200,000 people worldwide.

Other data presented later in this report document the dramatic increase of the plant trade, particularly in the 1970's. This is true in terms of numbers countries exporting to the United States, the dollar value of plants in U.S. trade, or the numbers of plants imported to the U.S.

The purpose of this report is to present and analyze some of the data of world trade in plants, particularly for U.S. exports and imports. The facts presented here represent nearly all of the data currently available on U.S. exports and imports of plants. Nevertheless, the data are inadequate in several respects discussed in detail later in the report. For instance, figures from various sources often fail to agree, and certain data may vastly underestimate actual volumes in trade. Particularly inadequate are data on U.S. exports of plants.

Table 1
Number of Societies Specializing in Plant Groups in Trade.

Category	Number of Specialty Groups Worldwide	Percent of Total
Cacti and Succulents	22	13
Orchids	73	44
Cycads	1	1
Insectivorous Plants	6	4
Ferns	8	5
Bromeliads	2	1
Palms	1	1
Rock Garden Plants	7	4
Lilies, Iris, and Flower "Bulbs"	5	3
Miscellaneous Houseplants	19	11
Outdoor Herbs and Shrubs	19	11
General Horticultural Societies	9	5
Miscellaneous Societies	5	3
Total	167	100

Source: Tabulation of Plant Societies of the World by Authors McCarten and Gibson. See Appendix B for a listing of these societies.

Chapter II

The Major Plant Groups in Trade

Many types of plants are in trade. This report, however, will focus on four major groups--cacti and succulents, orchids, insectivorous plants, and cycads--because they appear frequently in trade and because many of the plant species are protected by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), a 1975 treaty designed to monitor and control international trade in wild plants and animals.

A. Orchids

The Orchidaceae is the largest family of flowering plants, with an estimated 20,000 to 35,000 species (Arditti, 1966). The entire family is listed on CITES Appendix II and nine species are listed under the more protective provisions of Appendix I (see Chapter IV). Orchids are herbaceous plants from various habitats depending upon their geographic location. Most epiphytic (tree-dwelling) orchids naturally occur in the tropics while terrestrial orchids occur in tropical areas as well as the temperate and boreal zones (Willis, 1973).

Epiphytic orchids are more commonly found in trade than are terrestrial orchids, however, both are popular among orchid fanciers. Table 2 is a list of orchid species most often traded in 1970 and in 1979. The 1970 list was prepared by Hamilton (1970) using references to species available in trade and is not actually based on trade data. The 1979 list was compiled by the authors from a preliminary analysis of data collected for the United States 1979 CITES Annual Report compiled by the Wildlife Permit Office, U.S. Fish and Wildlife Service. Only two species, Dendrobium nobile and Epidendrum atropurpureum, the spice orchid, appear on both lists. However, both also contain many species of epiphytic orcids like Cattleya, Laelia, Oncidium, Epidendrum, and Encyclia. Two rare orchids in trade, Laelia jongheana and Vanda coerulea (the "blue vanda"), are depicted in Figure 1.

Commercial stocks of epiphytic orchids come from field-collected plants and from seeds. In the United States, nearly all of the native terrestrial orchids in trade are field-collected because it often costs less to collect than to propagate them artificially. Additionally, terrestrial orchids are difficult to propagate (see, for example, Fiske and Harper, 1980).

B. Cacti and Other Succulents

Succulents, including cacti, are most often purchased for their interesting growth forms, including fleshy, thickened stems and leaves, a result of their evolutionary adaptations to an arid environment; however, some tropical species like Rhipsalis, the "orchid cactus," are traded primarily for their flowers. Generally, two markets exist for cacti and succulents. The first is a mass market for small, easily grown plants. The other is for the more specialized collector.

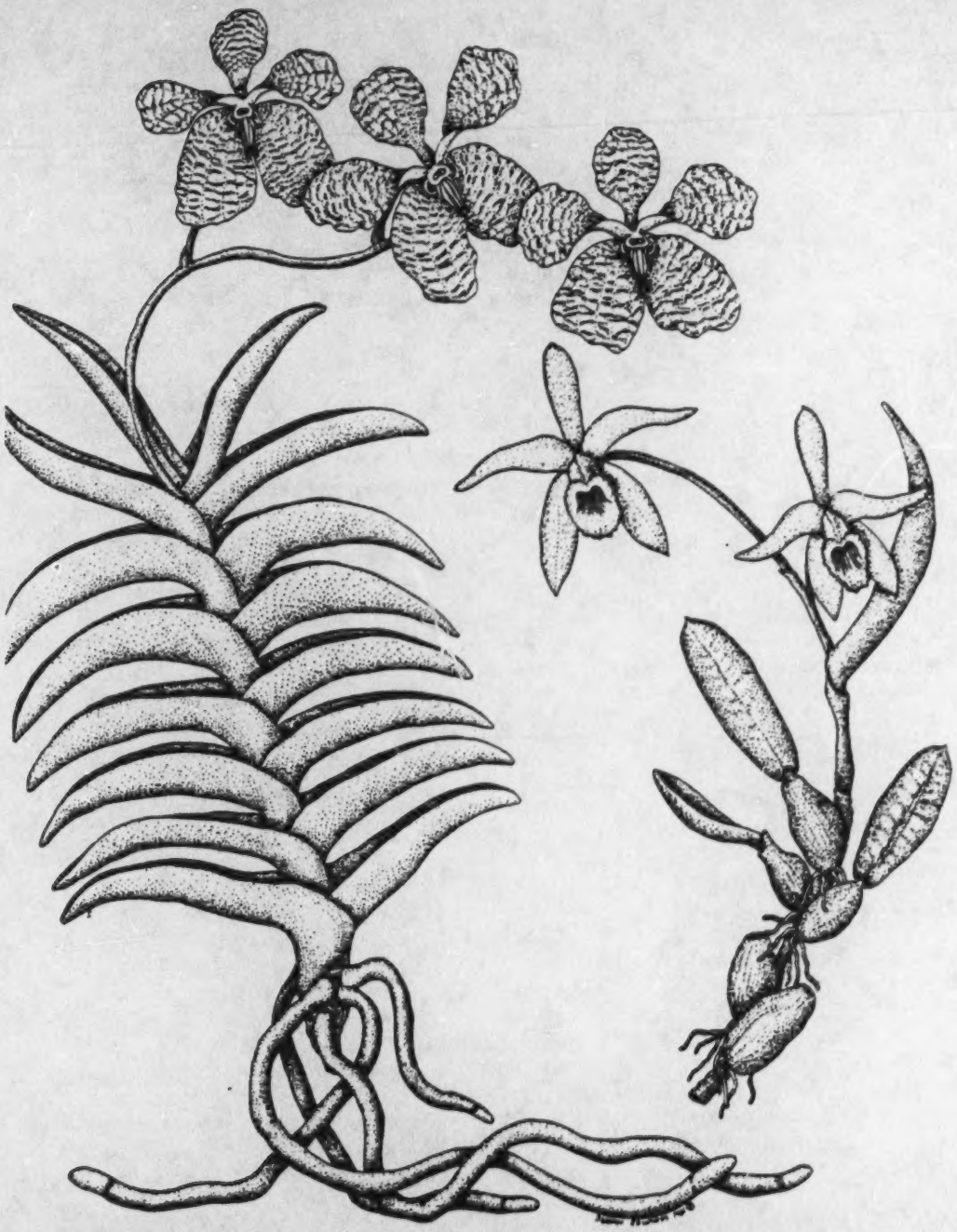


Figure 1. Vanda coerulea (left), the blue vanda, and Laelia jongheana (right) are orchid species listed on CITES Appendix I. Vanda coerulea has a wide distribution in mountainous regions of Burma, Thailand, and India, where it grows epiphytically on oak trees. This rare orchid species is prized for its blue flowers, a trait making it valuable for creating "blue vanda" hybrids. L. jongheana has large, magenta flowers whith fringed, yellow-white lips. This rare orchid species grows epiphytically on trees in the mountainous Minas Gerais region of Brazil. Its natural distribution has always been restricted. Both species are popular among orchid fancers.

Table 3 lists cactus species most commonly reported in trade based upon a recent report (McMahan, 1981a). The 69 taxa on this list represent all cacti reported as U.S. exports or imports in numbers exceeding 100 specimens from 1977 through 1979. Several species, Ariocarpus kotschoubeyanus (Kotschoubey living rock cactus) and Turbinicarpus pseudopectinatus, were traded in excess of 6,000 plants for the three year period.

Table 4 lists genera of non-cactus succulents commonly found in U.S. trade. This list is based upon availability of plants from three sources: (1) several major United States dealers of succulent plants; (2) from CITES reports of trade, and (3) from a list prepared by the United States Department of Agriculture (USDA) of imported plants that have harbored plant pests from 1970 to 1979.

Many succulents, including cacti, are often field collected (see Jarvis, 1978; and Chapter V). Others are easily and frequently propagated artificially. Of U.S. imports, many of the nearly 3 million cacti and succulents imported from Asia (Tarr, 1979) are cacti of the South American genus Gymnocalycium which are often artificially propagated in Japan for the U.S. market (McIntyre, pers. commun.). However, the nearly one million cacti and succulents imported into the U.S. from Mexico (Tarr, 1979) are judged by McCarten on the basis of his own field experience and knowledge of nursery practices in Mexico to be field-collected specimens. Two species popular in trade that are often field-collected in McCarten's judgement are Pelecyphora (Encephalocarpus) strobiliformis, the pinecone cactus, and Ariocarpus agavoides, a "living rock cactus," shown in Figure 2.

C. Cycads

The group of plants called "cycads" are represented by only ten genera of three families: Cycadaceae, Stangeriaceae, and Zamiaceae. These primitive plants are prized in horticulture for their large size, and their palm-like or fern-like leaves. Most cycads grow in tropical or semi-tropical regions. The Threatened Plants Committee Botanic Garden Conservation Coordinating Body lists 165 species as occurring worldwide, sixteen of which are reported as U.S. exports or imports from 1977 through 1979. The sago palm, Cycas revoluta, has been propagated and used in landscaping for over half a century, but in recent years, other cycads have become popular in trade. Table 5 is a list of cycads reported as U.S. exports or imports in 1977 through 1979. One rare species included in this list is Stangeria eriopsis, the "fern-leaved cycad," shown in Figure 3.

Since cycads take many years to reach marketable size, the large species in trade are almost certainly field-collected. The author Gibson reports that of five cycad nurseries known to him in South Africa, only one is propagating all of its stock. The number of cycads imported to the U.S. from South Africa alone in 1979 exceeded 2,000 specimens (U.S. CITES Annual Report, 1979). Collecting for the horticultural trade has had a major effect on wild populations of several cycads (Oldfield, 1981).

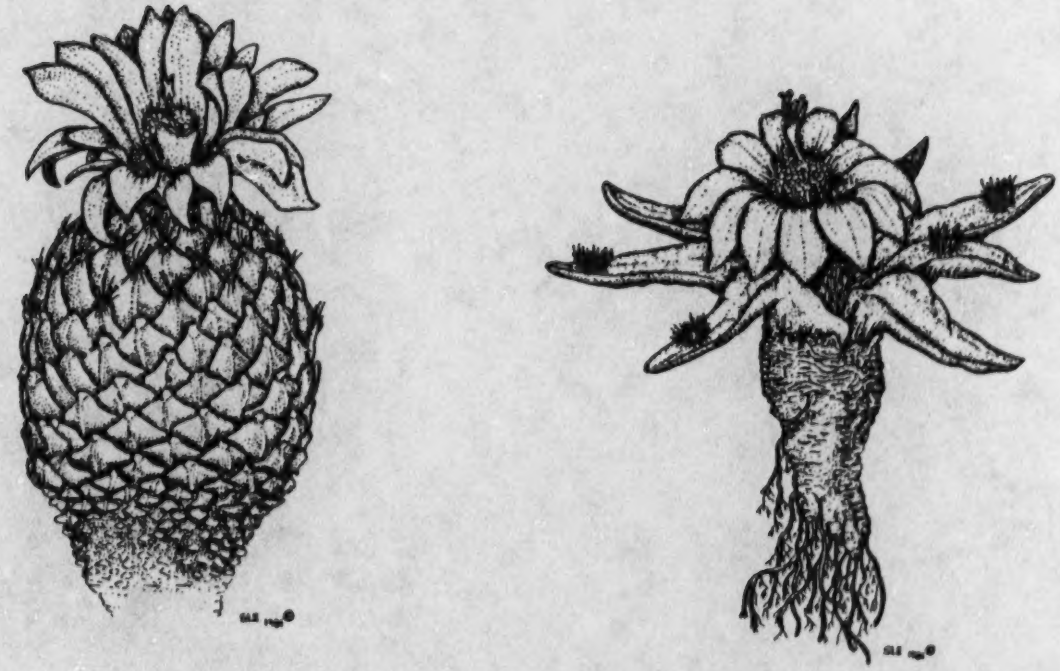


Figure 2. Pelecyphora strobiliformis (left), the pinecone cactus, and Ariocarpus agavoides (right), a "living rock" cactus, were recently added to CITES Appendix I. Both species are restricted to limestone hillsides in a small region of Tamaulipas State in Mexico. Both also have highly unusual shapes for cacti and seem to resemble stones. These species are rare in cultivation and difficult to grow from seeds.

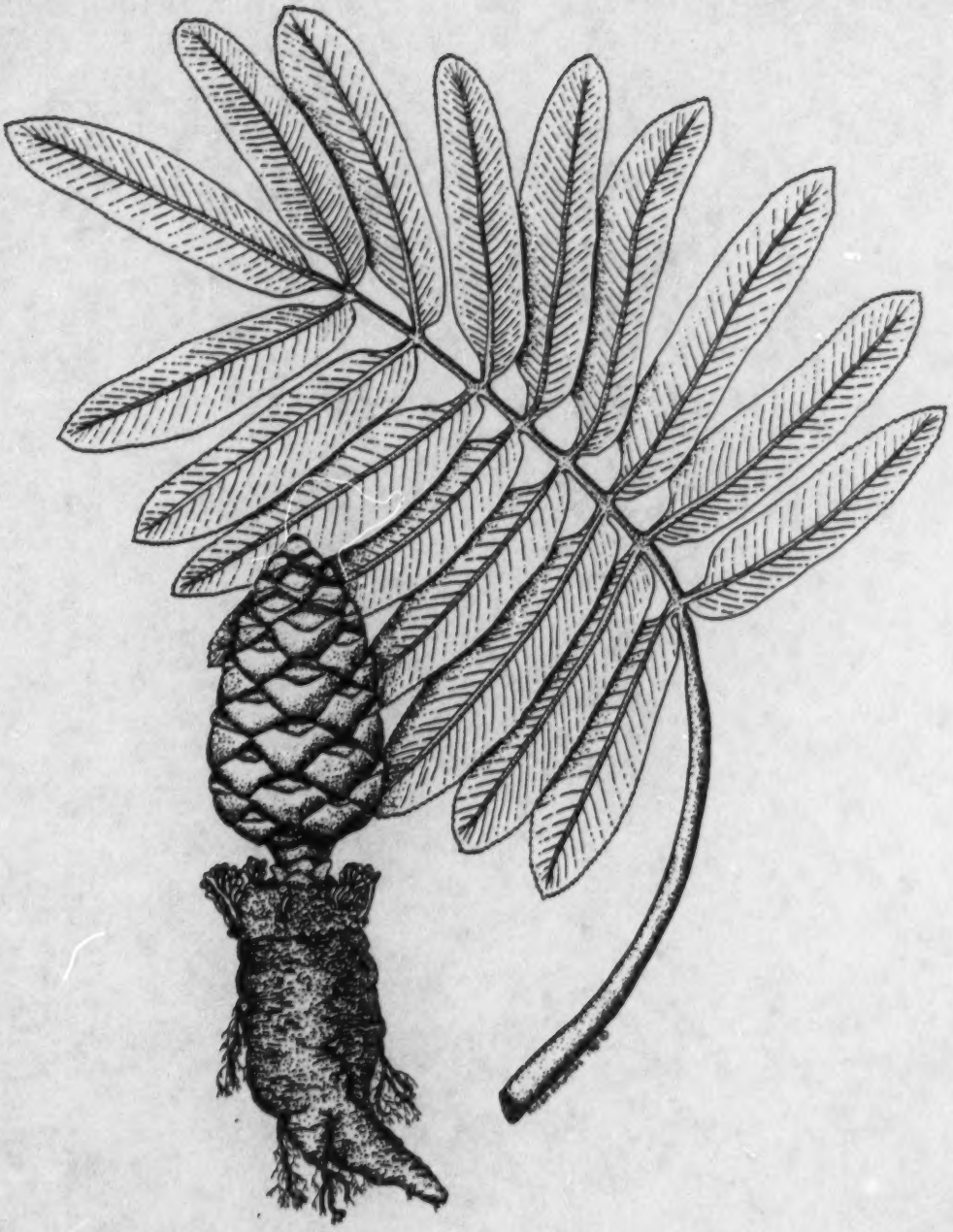


Figure 3. Stangeria eriopsis, the fern-leaved cycad, is the only member of the family Stangeriaceae. This species is listed in CITES Appendix I. In contrast to most cycads, this species produces fern-like foliage. It grows in savannahs and forests in a small region of the South African coast. Its female cones produce bright red, berry-like seeds.

D. Insectivorous Plants

Insectivorous plants are those that catch and digest insects, presumably as a supplemental nutritional source. Trade in these plants appears to cater to two distinct markets: mass market "novelty" plants and plants for specialized collectors. Table 7 lists the species of insectivorous plants currently listed on the CITES Appendices, including several species of pitcher plants, Darlingtonia californica (known as the California pitcher plant or the cobra lily), and others.

The mass market plants are primarily Venus flytrap, Dionaea muscipula, shown in Figure 7, and the cobra lily, Darlingtonia californica. The Venus flytrap is native to only a small coastal region of North and South Carolina in the United States. In November 1980, one wholesale dealer sent a letter to potential suppliers stating that she sold 50,000 Dionaea bulbs per month (Letter of Karen Tobin, Nurserymen's Exchange, November 15, 1980). According to a 1979 survey by author Gibson, four dealers alone sell a combined total of 1,750,000 flytraps each year. Gibson estimates that total sales of the Venus flytrap in the U.S. and abroad may have reached 4.4 million plants annually in the late 1970's and that as many as 90% of these may be field-collected specimens. However, demand for flytraps appears to have fallen in the last several years (Sutter, pers. comm.).

Despite the fact that almost all species of North American insectivorous plants are available from propagators, collecting from the wild remains the major source of these plants because of the relative benefits of collection versus propagation. By the mid-1970's, collecting had severely reduced wild populations of several species, including the pitcherplants Sarracenia alabamensis subsp. alabamensis (Alabama canebrake pitcherplant), S. jonesii (mountain sweet pitcherplant), S. oreophila, (green pitcherplant), and S. alabamensis subsp. wherryi, and a butterwort, Pinguicula ionantha (Ayensu and deFillips, 1978). In March 1981, the first three of these species were added to CITES Appendix I.

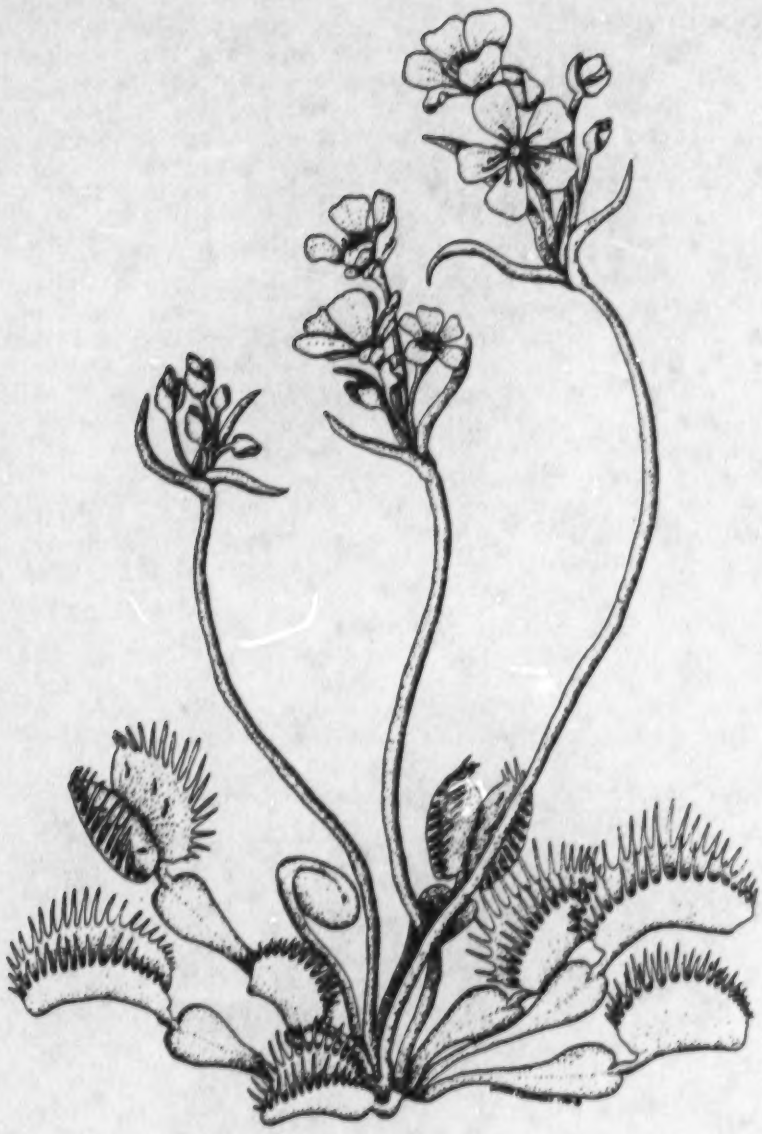


Figure 4. Dionaea muscipula, the Venus flytrap, catches ground dwelling insects in its specially adapted leaves called "traps" that vigorously snap shut on unsuspecting insects. This species grows in wet savannahs only in a small area along the North and South Carolina coast in the Eastern United States.

Table 2
Orchid Species Most Often Traded in 1970 and 1979 (in Order of Frequency).

1970)	1979
(Based on Hamilton, 1970)	(Based on Orchids Reported in Trade)*
1. Cattleya trianaei (christmas orchid)	1. Brassavola nodosa (lady of the night)
2. Paphiopedilum insigne (lady slipper)	2. Brassavola digbyana
3. Odontoglossum crispum	3. Epidendrum bractescens
4. Laelia purpurata (queen of orchids)	4. Oncidium spendidum (tiger orchid)
5. Cattleya labiata (autumn cattleya)	5. Epidendrum alatum
6. Laelia anceps	6. Dendrobium pierardii
7. Dendrobium nobile	7. Epidendrum cochleatum (Florida clamshell orchid)
8. Cattleya intermedia	8. Laelia rubescens (flor de Jesus)
9. Lycaste skinneri	9. Oncidium aurasinorum
10. Cattleya guttata	10. Dendrobium nobile
11. Epidendrum atropurpureum (spice orchid)	11. Oncidium cebolleta
12. Cattleya mossiae (spice orchid)	12. Epidendrum ciliare
13. Cattleya loddigesii	13. Broughtonia sanguinia
14. Sophronitis grandiflora	14. Barkeria glauca
15. Vanda coerulea (blue vanda)	15. Encyclia radiata
16. Cattleya skinneri	16. Encyclia chycophora
17. Phalaenopsis lueddemanniana	17. Epidendrum chacaoensis
18. Odontoglossum grande (tiger orchid)	18. Ondicium aboletta
19. Cattleya dowiana aurea	19. Ondicium luridum (mule ear orchid)
20. Vanda sanderiana	20. Rhychostylis retusa
21. Miltonia spectabilis	21. Paphiopedilum fairreanum (lady slipper)
22. Dendrobium fimbriatum	22. Epidendrum atropurpureum (spice orchid)
23. Laelia pumila	23. Pleione humilis
24. Rhychostylis gigantea (foxtail orchid)	24. Pleione praecox
25. Coelogyne cristata	25. Oncidium triquetrum

* This list includes the orchids reported as most heavily traded in 1979 under a preliminary analysis of CITES data.

Table 3
Cactus Species Reported as Most Heavily Traded as U.S. Imports or Exports, 1977-1979.

Scientific and Common Names	Number of Exports[1]	Number of Imports[1]	Total[2]	Number of 1979 Export Permittees[3]
Ariocarpus kotschoubeyanus (living rock cactus)	2,229	4,400	6,669	3
Turbinicarpus pseudopectinatus	1,331	5,335	6,666	2
Ariocarpus fissuratus var. lloydii (lloyd living rock cactus)	2,012	945	2,957	3
Ariocarpus agavoides (living rock cactus)	1,389	1,300	2,689	2
Astrophytum capricorne (goat's horn cactus)	593	1,300	1,893	2
Echinofossulocactus multicostatus	71	1,750	1,821	1
Mammillaria herrerae (herrera mammillaria)	1,120	600	1,720	1
Astrophytum myriostigma (bishop's cap)	516	1,026	1,542	4
Strombocactus disciformis	553	1,100	1,653	3
Epithelantha micromeris (button cactus)	700	950	1,650	2
Pelecyphora aselliformis (hatchet cactus)	964	624	1,588	2
Pelecyphora strobiliformis (pinecone cactus)	104	1,200	1,304	0
Ariocarpus retusus (living rock cactus)	721	574	1,295	3
Ariocarpus trigonus (living rock cactus)	996	200	1,196	2
Mammillaria elongata (golden lace cactus)	1,100	70	1,170	2
Ariocarpus fissuratus (living rock cactus)	795	0	795	3
Strombocactus pseudomachrochele	252	500	752	3
Strombocactus schmiedickianus	657	0	657	1
Mammillaria nejapensis	382	250	622	1
Mammillaria lenta	320	300	620	3
Ferocactus pilosus (pringle barrel cactus)	602	0	602	3
Obregonia denegrii (artichoke cactus)	572	0	572	3
Mammillaria pringlei (lemon ball cactus)	119	400	519	1
Turbinicarpus lophophoroides	126	380	506	1
Subpilocereus russelianus	500	0	500	unknown
Aztekium ritteri (aztec cactus)	62	420	482	unknown
Thelocactus bicolor (glory of Texas)	139	251	390	2
Echinocereus pectinatus var. neomexicanus (rainbow cactus)	342	0	342	1
Lemaireocereus victoriensis	341	0	341	1
Echinocactus asterias (sea urchin cactus)	335	0	335	2
Gymnocactus mandragora	332	0	332	1
Mammillaria candida (snowball pincushion cactus)	134	196	330	2
Astrophytum capricorne var. aureum	312	0	312	2
Ferocactus covillei	300	0	300	unknown
Echinocereus weinbergii	79	208	287	2

Table 3, continued.

Scientific and Common Names	Number of Exports[1]	Number of Imports[1]	Total[2]	Number of 1979 Export Permittees[3]
Thelocactus nidulans (bird's nest cactus)	170	100	270	2
Echinocactus texensis (horse crippler)	269	0	269	3
Mammillaria muehlenpfordtii	2	250	252	0
Leuchtenbergia principis (prism cactus)	230	0	230	unknown
Coryphantha dasyacantha	230	0	230	1
Echinocereus delaetii (old lady cactus)	230	0	230	1
Melocactus matanzanus (turk's cap)	216	0	216	3
Epithelantha micromeris var. greggii	205	0	205	2
Neocardenasia herzogiana	201	0	201	2
Melocactus bahiensis (turk's cap)	200	0	200	1
Astrophytum capricorne var. niveum	200	0	200	2
Astrophytum cohuilense	200	0	200	4
Cephalocereus senilis (old man cacatus)	135	26	161	4
Echinocactus grusonii (golden barrel cactus)	160	0	160	2
Ferocactus wislizenii (fishhook barrel)	152	0	152	2
Mammillaria geminispina (whitey)	101	40	141	2
Mammillaria polythele	100	40	140	1
Echinocactus horizonthalonius (mule crippler)	137	0	137	2
Echinofossulocactus coptogonus	54	75	129	1
Myrtillocactus geometrizans	122	0	122	0
Mammillaria albilanata	21	100	121	2
Mammillaria egregia	121	0	121	unknown
Mammillaria humboldtii	113	0	113	unknown
Mammillaria elegans	111	0	111	unknown
Turbinicarpus flaviflorus	110	0	110	1
Mammillaria coahuilensis	106	0	106	2
Coryphantha macromeris (long mamma)	102	0	102	1
Ferocactus gracilis	100	0	100	2
Ferocactus viridescens var. littoralis	100	0	100	2
Gymnocactus horstii var. buinekeri	100	0	100	1
Lemaireocereus pruinosus (powder blue cereus)	100	0	100	0
Echinocereus websterianus	100	0	100	1
Wilcoxia schmollii (lamb's tail cactus)	0	100	100	0
Astrophytum capricorne var. senile	100	0	100	2
Total for the 68 species listed above	25,689	25,010	50,699	

[1]data from McMahan 1981a, compilation of U.S. exports from 1977-1979.
[2]data from McMahan 1981a, page 13, Table 8.
[3]data from analysis of 1979 CITES data, courtesy of the International Convention Advisory Commission. "0" means no exports were reported for 1979. There were approximately 10 plant dealers specifying exports sufficiently to determine the species listed in this table in 1979.

Table 4
Selected Genera of Succulents Other Than Cacti Common in Trade

Family	Genus
Agavaceae (Agave Family)	Agave[1,2]
	Dracaena[1,2]
	Sansevieria[1,2]
	Yucca[1,2]
Aizoaceae	Conophytum[1]
	Faucaria[1]
	Fenestraria[1]
	Lithops[1,2]
	Mesembryanthemum[1,4]
	Pleiospilos[1]
Apocynaceae	Adenium[1,2]
	Pachypodium[1,2,3]
	Plumeria[2]
Asclepiadaceae (Milkweed Family)	Caralluma[1,2]
	Ceropegia[1,4]
	Hoya[1,2]
	Huernia[1,2]
	Sarcostemma[1]
	Stapelia[1,2]
Crassulaceae (Crassula Family)	Aeonium[1]
	Aichryson[1]
	Cotyledon[1,2]
	Crassula[1,2]
	Dudleya[1,4]
	Echeveria[1,2]
	Graptopetalum[1]
	Kalanchoe[1,2]
	Monanthes[1]
	Pachyphytum[1]
	Sedum[1,2]
	Sempervivum[1]
Cucurbitaceae (Cucumber Family)	Ibervillea[1,4]
Didiereaceae	Alluaudia[1,3]
	Alluaudiopsis[1,3]
	Decarya[1,3]
	Didierea[1,3]
Euphorbiaceae (Spurge Family)	Euphorbia[1,2,3]
	Jatropha[1,2]
	Monadenium[1]
	Pedilanthus[1,2]
Fouquieriaceae	Fouquieria[4]
Liliaceae (Lily Family)	Aloe[1,2,3]
	Bowiea[1]
	Gasteria[1]
	Haworthia[1,2]
Portulacaceae	Anacampseros[1]
Vitidaceae (Grape Family)	Cissus[1,4]

[1]Plant available from one of three major dealers of succulent plants in 1981 catalogs: Abbey Gardens, Grigsby Cactus Gardens, or Altman Specialty Plants.
[2]United States Department of Agriculture, 1981. List of Intercepted Plant Pests, October 1, 1978 through September 30, 1979, APHIS Publication 82-7.
[3]McMahan (1981b) shows this species reported in trade in 1977-1979.
[4]APHIS Host Dictionary, a computer list of imported plant species reported as harboring plant pests, 1970-1979, courtesy of USDA.

Table 5
Cycads reported as U.S. Imports or Exports, 1977-1979.

Family	Scientific Name	Common Name
Cycadaceae	Cycas revoluta	sago palm
Stangeriaceae	Stangeria eriopsis	fern-leaved cycad
Zamiaceae	Bowenia spp.	--
	Ceratozamia hildae	horncone
	Ceratozamia kuesteriana	kuster horncone
	Ceratozamia mexicana	Mexican horncone
	Ceratozamia mexicana var. latifolia	--
	Dioon edule	chestnut dioon
	Dioon mejiae	--
	Dioon spinulosum	giant dioon
	Encephalartos coccinnus	--
	Macrozamia spp.	--
	Zamia lindeni	Ecuador zamia
	Zamia loddigesii	loddiges zamia
	Zamia pseudoparasitica	treetrunk zamia
	Zamia pumila	Jamaica sago tree
	Zamia skinneri	Panama zamia

Source: Analysis of CITES species in U.S. Trade by McMahan, 1981a.

Table 6
Insectivorous Plants Listed on CITES Appendices.

Family	Scientific Name	Common Name	CITES Listing
Byblidaceae	Byblis spp.	rainbow plant	Appendix II
Cephalotaceae	Cephalotus follicularis	albany pitcherplant	Appendix II
Nepenthaceae	Nepenthes rajah	giant pitcherplant	Appendix I
Sarraceneaceae	Darlingtonia californica	cobra lily	Appendix II
	Sarracenia alabamensis subsp. alabamensis	Alabama canebrake pitcherplant	Appendix I
	Sarracenia jonesii	mountain sweet pitcherplant	Appendix I
	Sarracenia oreophila	green pitcherplant	Appendix I

Chapter III

Plant Trade

A. Sources of Data

Statistics on U.S. plant trade are available from three sources: the U.S. Commerce Department, the U.S. Department of Agriculture (USDA), and CITES Reports and records.

Customs Service

When a plant shipments arrives in the United States, the Customs Service first reviews the importation form completed by the importer before transferring the shipment to the USDA. The Bureau of Census, Department of Commerce, compiles Custom Service statistics on imports of many general plant categories, primarily agricultural or horticultural commodities. Orchids are the only CITES-listed plants recorded in Customs Service statistics. Customs data show import numbers, price, and country of origin. Plant shipments with a declared value of under $250 are not included; thus, scientific specimens entering the U.S. with no declared value are omitted. Customs statistics analyzed in this report cover the period of 1947-1980. Prices are declared value only and do not necessarily reflect the actual market value of the plants imported.

USDA

Following Customs, plants shipments are routed to the Animal and Plant Health Inspection Service (APHIS), at USDA. APHIS checks the shipments for plant pests and diseases and for CITES documentation before releasing them. APHIS inspects approximately 165 million plant "units" imported in the U.S. each year and compiles monthly summary information. These summaries show information by port of entry, but are usually reported only by plant group and not by genus or species. Thus cacti and succulents are reported together, orchids are reported as a group, and only a few genera like Cyclamen and the succulent genus Ceropegia receive detailed accounting. Most of the APHIS import data in this report covers only three ports on entry (Miami, Los Angeles, and New York) which are estimated to handle 95% of all U.S. plant trade (McIntyre, pers. comm.).

CITES

CITES permits accompanying plant shipments are sent by APHIS to the Wildlife Permit Office, Fish and Wildlife Service, U.S. Department of Interior, where the CITES Annual Reports are compiled. USDA estimates that approximately 10% of all plant unites, or 16.5 million plants imported into the U.S. each year are CITES species, and that approximately 279,000 CITES plants are exported from the U.S. each year (McMahan, 1981a). The 1979 U.S. CITES Annual Report recorded imports of approximately 1.5 million CITES plants in 1979. When this is compared to the above USDA

estimates, it would appear that CITES documents are not accompanying all exports and imports of CITES species, or that the documents are not being sent to the U.S. Wildlife Permit Office to be compiled.

Major problems still plaguing CITES reporting in the United States include lack of detailed reporting. For example, 97% of CITES U.S. imports in 1979 were reported only to the family level (McMahan, 1981a). Furthermore, the U.S. CITES reporting system does not record exports and imports of most CITES plants.

In addition to the 1978 and 1979 U.S. annual reports, CITES reports from other countries were analyzed for their plant trade statistics. CITES reports sometimes show detail to the genus or species level, but many Parties still fail to record plant trade in their annual reports. In general, the CITES annual reports remain incomplete and sometimes contradictory. The CITES reports remain valuable in one repect: they are the only source providing any detail of the genera and species actually in trade.

The major problem with all of these sources is that data from one source are incompatible with data from others, thus providing puzzling contradictions when one attempts to compare them. For example, APHIS reports U.S. imports of "cacti and succulents," Customs does not identify cacti separately, and CITES reports list "Cactaceae" or genera and species. Comparisons of CITES annual reports from Party countries show similar discrepancies.

Despite the above problems with the data, we include them in this report to make them available for outside review and further analysis.

B. Trade Statistics

Data from the U.S. Customs Service and from other sources document the rising popularity of plants in trade in the last 50 years. The Customs data on numbers of plants imported into the United States illustrate this general trend. Table 7 and Figure 5 show the number of live plants suitable for planting, kilograms of flower seeds, and number of orchids imported into the U.S. from 1947 to 1980. Volumes of all three categories appeared to peak in 1975-1977, but then declined near 1980.

Table 8 and Figure 6 show the number of countries exporting live plants suitable for planting, flower seed, and orchids to the United States from 1947-1980. All categories show a dramatic increase in number of exporting countries near 1970, and a continuing increase throughout the decade. The number of countries exporting orchids in the late 1970's was roughly double that of the 1960's.

A third indicator of this trend is the value of plants imported in these categories to the United States over the period of 1955 to 1980 as shown in Table 9 and Figure 7. The increase in dollar value of these imports follows roughly the same trend as the volume of plants. For example, the declared value of orchid imports was approximately $50,000 in the early 1960's, but rose to over $200,000 by the late 1970's. This trend is somewhat less dramatic, however, when values are adjusted to reflect inflation. A similar trend is reflected in the wholesale value of tropical foliage plants purchased in the U.S. from 1959 to 1976 (Table 10 and

foliage plants purchased in the U.S. from 1959 to 1976 (Table 10 and Figure 8). The wholesale value of tropical foliage plants approached 2.5 million dollars by 1976, nearly tripling the 1973 figure.

Several data sources show that the trade in plants includes many species. Since 1970, APHIS has recorded the genera or species of plants imported into the United States on which agricultural pests were found; included are 69 genera and 82 species of orchids and 28 genera and 40 species of cacti. In the period from 1977 to 1979, imports and exports of 115 genera of cacti, incorporating 602 species, and about 100 genera of and 1000 species of orchids were recorded in CITES reports (McMahan 1981a). Since the CITES data, in effect, are a sample representing only some unknown proportion of the actual number of plants traded, and since only half of plants were identified to the genus or species level, the actual number of species in trade may be much higher.

An examination of USDA data sources (Table 11) suggests that cacti and succulents are a large part of the U.S. plant trade; imports averaged over five million plants annually for 1978 and 1979. Table 11 also gives APHIS summary figures for orchids and cycads. Orchid imports averaged about half a million annually in 1978 and 1979. The comparable figure for cycads is a little over 33,000. These data are summarized in Figure 9. Asia is, by far, the country exporting the largest number of orchids, cacti, and succulents to the United States, supplying approximately one half of this trade. The remaining U.S. imports in orchids, cacti, and succulents is supplied by Central and South America, including Mexico. Nearly 90% of cycads imported in the United States come from Central America and Mexico, with the remaining coming from Australasia or Africa.

Orchids

From an examination of the data discussed above, it appears that the trend in orchid imports to the United State is part of the general increase for house and garden plants over the last ten years, and is not linked to CITES which became effective in 1975. Numbers of orchids imported in recent years have increased from fewer than 50,000 per year in the early 1950's to over 400,000 per year in the late 1970's.

The general trend of increases in world trade of orchids during the 1970's is also shown elsewhere. Kores (1977) followed orchid exports from Papua New Guinea from the early 1960's through the mid-1970's, and found that exports increased from fewer than 2,000 orchids per year in the 1960's to nearly 10,000 orchids by 1977 (Figure 10). Table 12 and Figure 11 show the same trend in kilograms of orchids exported from Brazil from 1974 to 1977. In 1974, approximately 3,000 kilograms of orchids were exported. By 1976, this figure rose to over 6,000 kilograms by 1976 and fell to 5,500 in 1977. Exports to the United States accounted for approximately one-half of Brazilian exports during this period.

Customs data on U.S. imports of orchids from 1947 to 1980 are broken down in Table 13 to show country of export. The number of countries exporting orchids to the United States has grown from about 12 in 1960 to over 30

in 1978. These data show that the countries exporting the most orchids to the United States from 1978 to 1980 are Japan, Thailand, Guatemala, and France, each exporting an annual average of over 20,000 plants to the U.S. over the three year period. The countries supplying orchids to the United States has also changed over the last 30 years. Table 14 shows the major supplying countries for the ten year periods of 1951-1960 and 1971-1980. As an example, the United Kingdom supplied the United States with over 25% of the orchids imported in 1951-1960; but by 1971-1980, the figure had dropped to less than 1.0%. The largest supplier in 1971-1980, India with approximately 15% of the U.S. orchid trade, only supplied about 2% of the U.S. market in 1951-1960.

Table 15 and Figure 12 show detail of price trends per orchid plant imported from 1955 through 1980. Note that all U.S. dollar figures here are based on declared value alone and are not necessarily related to the market value of the plants. In general, declared prices per orchid plant were higher in 1955 that they were in 1980, falling from over $5.00 per plant in 1955 to less than $2.00 in the mid 1970's. When adjusted to show the effects of inflation (1980 dollars), declared prices were roughly eight times higher in 1955 than in 1980. Such a decrease could be due to the dramatic increase in the availability of plants from either propagated or field collected sources, or from changes in types of plants traded.

The available data suggest a trend in the 1970's trade in orchids: a growing demand for true species as opposed to the often more spectacular hybrids. Kores (1977) notes this trend in orchid exports from Papua New Guinea. U.S. import statistics also indicate a strong trade in species. A sample of 40 permits representing over 30 countries included 10,593 orchid plants: over 91% were species rather than hybrids. Eighty percent of the shipments contained only species, not hybrids. Another indicator of this trend is the pattern of illustrustrations in the American Orchid Society Bulletin. Gibson examined these illustrations over nearly 20 years and found an increasing ratio of species illustrated compared to the more showy hybrids. These results are shown in Table 16 and Figure 13.

Cacti and Other Succulents

It is difficult to estimate how many CITES-listed cacti and succulents are imported and exported each year. As noted in a recent report (McMahan, 1981a), cacti alone may account for 60-70% of the U.S. imports of live CITES plants, possibly as many as 10 million plants annually.

A recent National Wildlife Federation report summarized data on cactus and succulent imports through the 14 APHIS ports of entry (Tarr, 1979). Not all of these imports are CITES-listed species since many non-CITES succulent species are in trade. Table 17 summarizes cactus and succulent imports through all 14 ports of entry for the 20 month period from October, 1977 through May, 1979. Several interesting facts emerge from these data. For fiscal year 1978, 2,255 shipments of cacti and succulents entered the United States, totalling nearly 7 million plants. For 8 months of fiscal year 1979, comparable figures were 1,454 shipments and approximately 4.5 million plants. Over the twenty-month period, individual shipments of cacti and succulents averaged 3,091 plants in each shipment. Most cacti and succulents enter the United States through San Francisco,

38% entered through this port or entry. Many of those cacti and succulents passing through San Francisco are artificially propagated plants from Japan (McIntyre, pers. comm.). Other ports of entry with over 10% of the cactus and succulent imports for fiscal years 1978 or 1979 are Brownsville, Texas; John F. Kennedy Airport, New York; Los Angeles, California; and Miami, Florida. Together, these five ports account for approximately 97% of cactus and succulents imports. Note that the three major ports of entry for cacti and succulents (San Francisco, Brownsville, and Miami) differ from that for all plants combined (Miami, New York, and Los Angeles).

The National Wildlife Federation report reveals other trade patterns. Table 18 and Figure 14 show the seasonal variation through these five major ports of entry into the United States. The data show marked seasonal variation in imports, with peaks occurring in late Spring and late Fall. Table 19 gives a more detailed analysis of U.S. sources for cactus and succulent imports. Major exporting countries for 1978 were Japan with over three million plants, Mexico with over one million plants, and the Dominican Republic and the Netherlands, each with approximately 250,000 plants.

C. Data Problems and Inconsistencies

Several problems are evident in analyzing the available data on trade in plants. A recent report on U.S. cactus trade (McMahan, 1981a) highlighted some of the problems specific to U.S. CITES data probably are widespread in other countries. One of these is poor identification of plants reported in trade. Ninety-four per cent of cactus imports recorded in U.S. CITES reports from 1977-1979 were identified only as Cactaceae, another 0.6% were identified only by genus (Table 20). Although reporting efficiency appears to be increasing in the United States (Table 21 and Figure 15), even the 1979 export figures of over 78,000 CITES plants exported may not reflect actual exports, estimated by USDA to be approximately 279,000 plants per year. Part of this reporting deficiency may be attributed to the fact that the number of specimens in many shipments are not specified or because copies of permits never reach the Wildlife Permit Office for compilation. In 1979, a total of 243 shipments of cacti had an unspecified number of specimens (McMahan, 1981a).

Other problems become evident when trying to compare data from various sources. Table 22 shows country-by-country comparisons of CITES and U.S. Customs data for 1978 for U.S. orchid imports. Table 23 compares similar statistics for 1979, adding APHIS figures to the comparison. It becomes readily apparent that figures from the three sources differ significantly from each other.

D. CITES Plant Trade

Tables 24 through 27 summarize the plant trade as reported by the CITES parties. Each table also compares exports for one year to reports from importing countries. A review of these comparisons confirms that CITES data are not yet adequate as a basis for a detailed study of the plant trade. Many important trading countries are not yet Parties; many Parties do not yet report any plant trade statistics. Those that do may have

reporting policies which reduce the completeness of the data. For example, most countries report only the number of import licenses applied for, not the actual numbers of plants imported, while others do not report shipments of plants declared to be artificially propagated. Each Party may declare reports of plants in trade in a different manner. Some countries generalize by family, other Parties report by genus, and a few list species of plants exported or imported. Also confusing are the many ways plants are counted; some reports list plants by numbers, other by weight, cartons, or shipments. Orchids and cacti represent, by far, the largest groups of plants recorded in trade by the CITES Annual Reports. Cycads make up a large proportion of trade in some countries, like South Africa. Reported trade in other genera is sporadic and often small.

Several countries fail to record trade in CITES species that other sources indicate does occur. For example, APHIS monthly summaries records imports of Cyclamen plants listed on the CITES Appendices but these do not show up in the Annual Reports of the U.S. or other countries. Similarly, CITES-listed Banksia is reported as a U.S. plant import harboring plant pests in fiscal year 1979 (USDA, 1981), yet does not appear in the U.S. CITES Annual Report.

By the end of 1979, the 43 countries that were CITES Parties in 1977 should have already submitted a 1978 CITES report to the Secretariat. Similarly, the 51 countries which were members by December 1978 should have submitted their 1979 annual reports by 1981. However, only 35 CITES annual reports were submitted in 1978 and 27 in 1979. Of these, only 11 countries list plant trade data in their 1978 reports versus 10 countries for the 1979 reports. In both 1978 and 1979, plant exports dominated trade statistics while imports were recorded by only 5 countries in 1978 and 2 (U.S. and W. Germany) in 1979.

Table 7
Live Plants, Flower Seeds, and Orchids Imported into the United States, 1947-1980.

Year	Live Plants Suitable for Planting (No.)	Flower Seeds (Kg)	Orchids (No.)
1947	--	54,623	264,790
1948	--	2,431	9,486
1949	--	48,796	96,421
1950	--	40,172	107,410
1951	--	55,578	36,321
1952	--	55,632	69,417
1953	--	74,623	79,352
1954	--	99,290	25,231
1955	--	76,963	20,813
1956	--	62,142	22,920
1957	--	49,905	33,866
1958	--	41,914	17,250
1959	--	65,550	57,599
1960	--	97,303	49,339
1961	--	78,350	90,443
1962	--	73,304	63,451
1963	--	39,219	36,203
1964	1,655,401	99,821	93,013
1965	828,330	87,904	54,385
1966	1,112,507	97,844	111,838
1967	1,005,449	96,612	128,530
1968	4,491,812	71,845	119,656
1969	3,809,465	83,863	88,674
1970	4,729,221	80,313	60,410
1971	17,196,083	80,712	119,462
1972	35,049,549	94,968	190,301
1973	43,769,754	97,667	102,618
1974	75,252,822	75,953	171,008
1975	122,249,812	109,190	415,149
1976	160,509,203	152,562	280,910
1977	171,668,671	247,666	374,815
1978	155,697,000	98,586	234,521
1979	156,574,460	69,467	203,039
1980	134,934,371	112,625	137,117

Blank spaces indicate that data is unavailable for those years.

Source: U.S. Imports for Consumption (IM-146), Customs Service (U.S. Department of Treasury) statistics, compiled by the Bureau of Census, U.S. Department of Commerce.

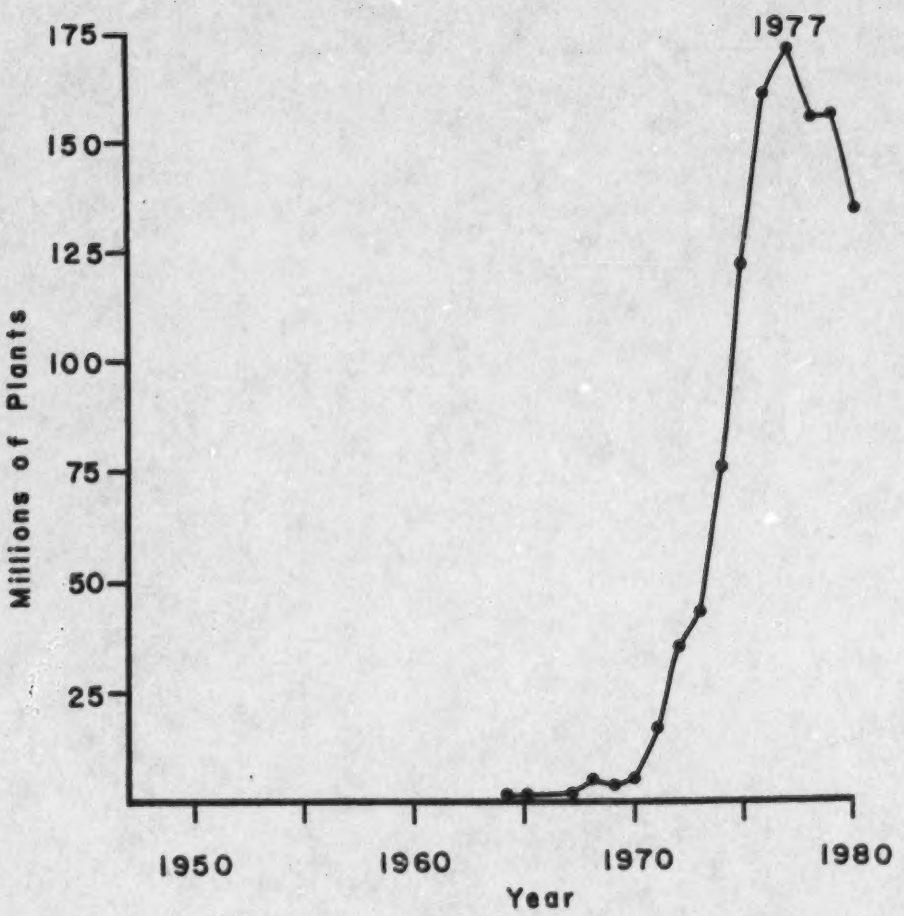


Figure 5. Live Plants, Flower Seeds, and Orchids Imported into the United States, 1947-1980.

Figure 5a. Live Plants Suitable for Planting.

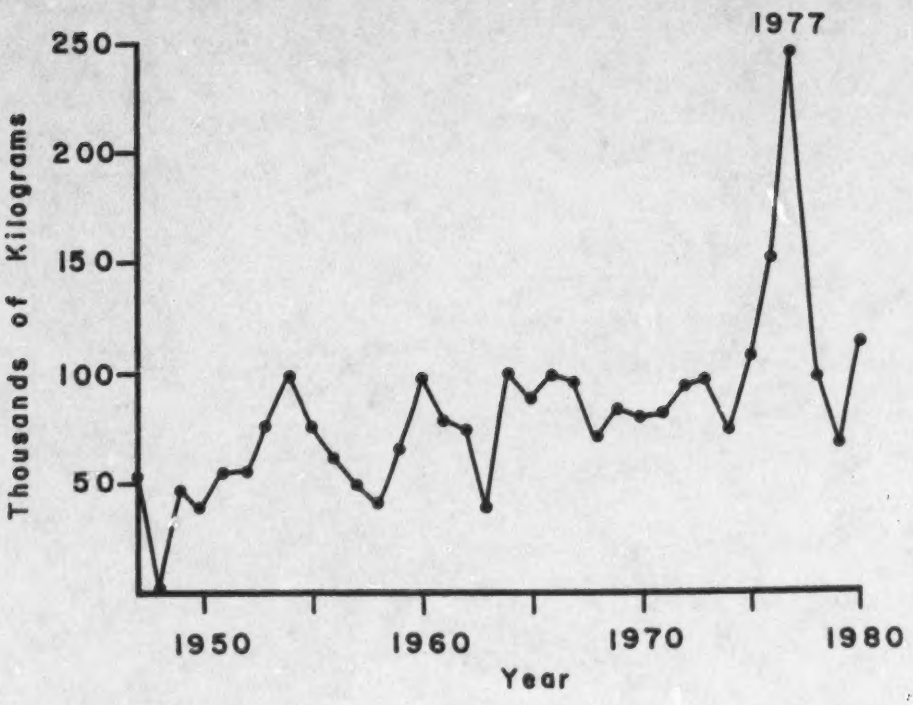


Figure 5b. Flower Seeds.

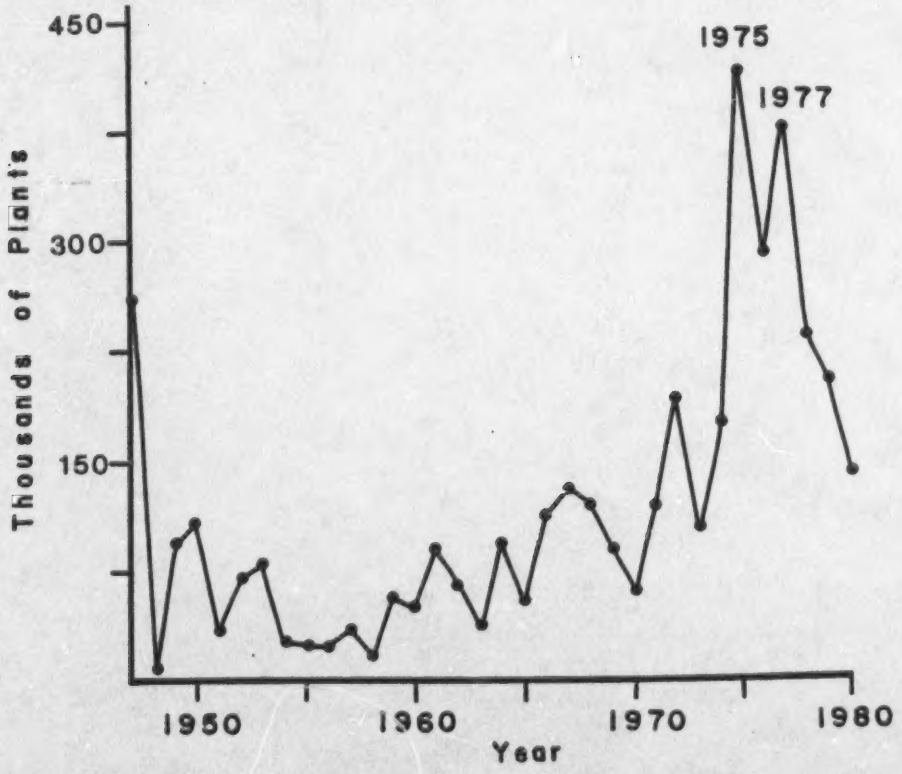


Figure 5c. Orchids.

Table 8
Numbers of Countries Exporting Several Classes of Plants to the United States, 1947-1980.

Year	Category of Plants Exported to the U.S.		
	Live Plants Suitable for Planting	Flower Seeds	Orchids
1947	--	12	21
1948	--	7	8
1949	--	14	17
1950	--	12	21
1951	--	14	16
1952	--	14	21
1953	--	13	16
1954	--	12	14
1955	--	12	13
1956	--	17	14
1957	--	11	17
1958	--	13	12
1959	--	12	14
1960	--	11	17
1961	--	13	14
1962	--	13	14
1963	--	12	17
1964	11	15	17
1965	--	--	--
1966	--	--	--
1967	10	15	18
1968	15	20	16
1969	16	17	16
1970	18	14	20
1971	20	20	24
1972	19	18	25
1973	27	19	25
1974	39	16	26
1975	44	21	30
1976	48	20	28
1977	53	23	33
1978	52	24	30
1979	52	24	27
1980	63	23	29

Blank spaces indicate that information is unavailable for that year.

Source: U.S. Imports for Consumption (IM-146), Customs Service (U.S. Department of Treasury) statistics, compiled by the Bureau of Census, U.S. Department of Commerce.

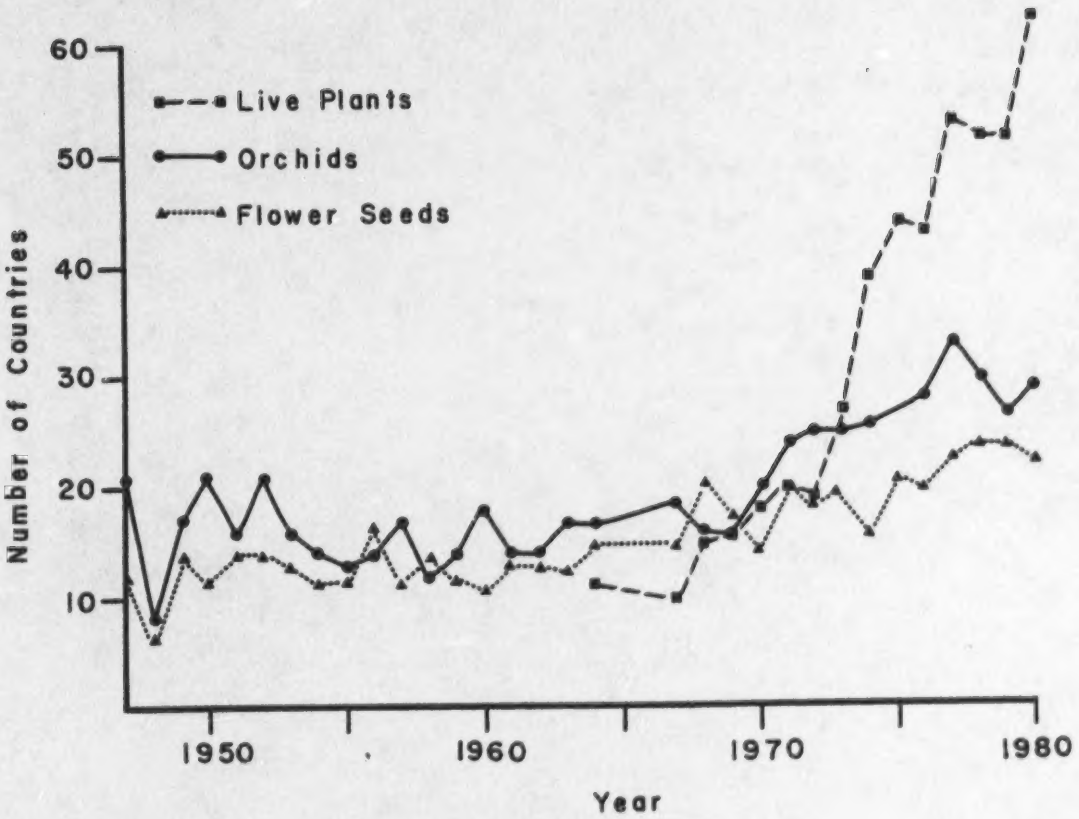


Figure 6. Number of Countries Exporting Several Classes of Plants to the United States, 1947-1980.

Table 9
Value of Several Categories of Plants Imported to the United States, 1955-1980,
Reported and Constant (1980) U.S. Dollars

Year	Live Plants Suitable for Planting		Flower Seeds		Orchids	
	Reported Dollars	1980 Dollars	Reported Dollars	1980 Dollars	Reported Dollars	1980 Dollars
1955	--	--	427,760	1,315,444	115,381	355,063
1956	--	--	473,111	1,436,413	104,056	315,491
1957	--	--	422,349	1,236,486	91,146	255,843
1958	--	--	402,739	1,147,761	39,264	111,897
1959	--	--	509,980	1,441,732	72,141	203,946
1960	--	--	544,893	1,516,117	56,196	156,360
1961	--	--	533,458	1,469,391	36,811	101,395
1962	--	--	585,468	1,444,935	38,140	103,895
1963	--	--	347,616	935,568	45,398	122,183
1964	336,877	894,954	849,939	2,257,965	57,577	152,959
1965	293,306	766,010	1,090,509	2,848,017	54,195	141,537
1966	396,025	1,005,545	1,149,021	2,917,473	123,064	312,471
1967	360,201	888,976	1,030,718	2,543,812	113,142	279,234
1968	508,016	1,205,561	1,002,504	2,379,019	118,911	282,186
1969	508,242	1,142,385	1,184,104	2,661,538	84,723	190,433
1970	750,715	1,593,092	1,381,780	2,932,273	70,232	149,040
1971	1,008,439	2,051,794	1,362,353	2,771,877	74,841	152,273
1972	1,813,376	3,571,756	1,971,632	3,883,470	101,938	200,784
1973	2,852,126	5,288,539	2,411,761	4,471,996	93,917	174,145
1974	6,599,000 *	11,026,629	2,609,252	4,359,942	123,449	206,278
1975	9,835,098	15,057,556	4,045,336	6,193,479	290,920	445,404
1976	15,484,385	22,413,761	4,357,719	6,307,830	216,311	313,123
1977	16,698,794	22,706,678	4,857,074	6,604,551	297,130	404,031
1978	16,265,955	20,544,717	5,580,695	7,048,608	248,434	313,784
1979	18,760,908	21,298,030	6,520,353	7,402,129	233,816	265,436
1980	16,725,578	16,725,578	7,625,275	7,625,275	258,195	258,195

* Numbers are rounded to the nearest thousand dollars.

Note: Data before 1955 are not compatible with data after 1955, so figures prior to 1955 are not included here.

Source: U.S. Imports for Consumption (IM-146), Customs Service (U.S. Department of Treasury) statistics, compiled by the Bureau of Census, U.S. Department of Commerce.

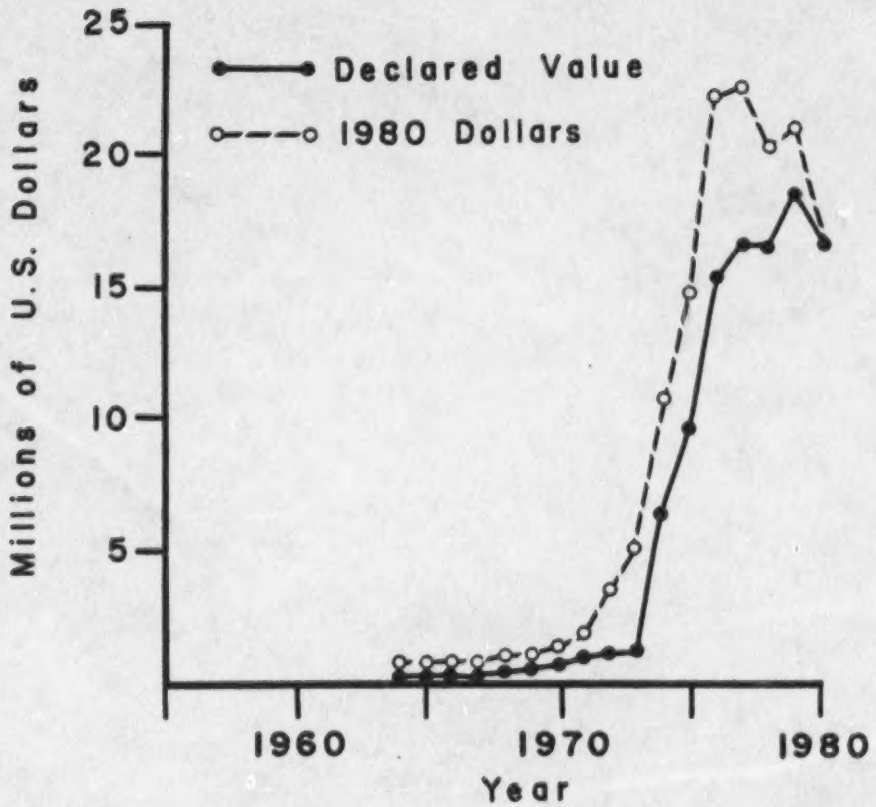


Figure 7. Value of Several Categories of Plants Imported into the United States, 1955-1980, Reported and Constant (1980) U.S. Dollars.

Figure 7a. Live Plants Suitable for Planting.

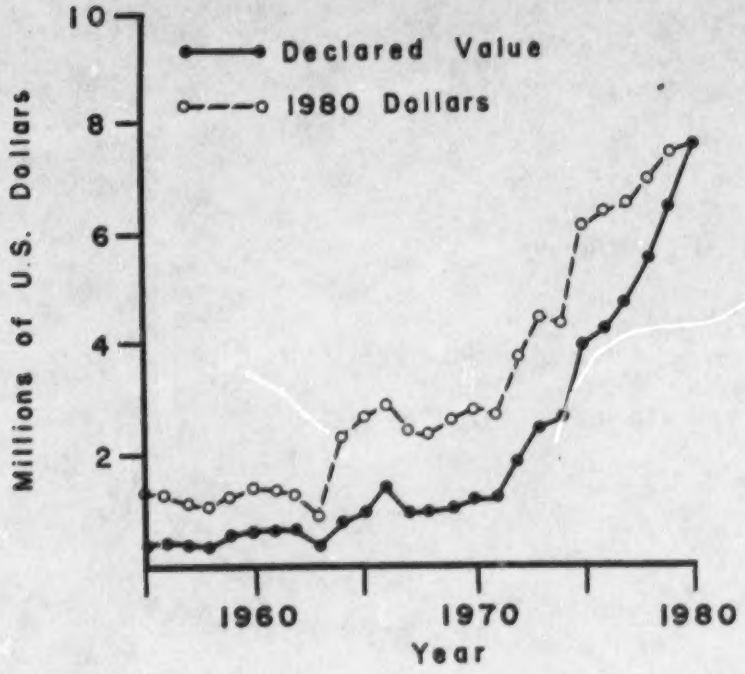


Figure 7b. Flower Seeds.

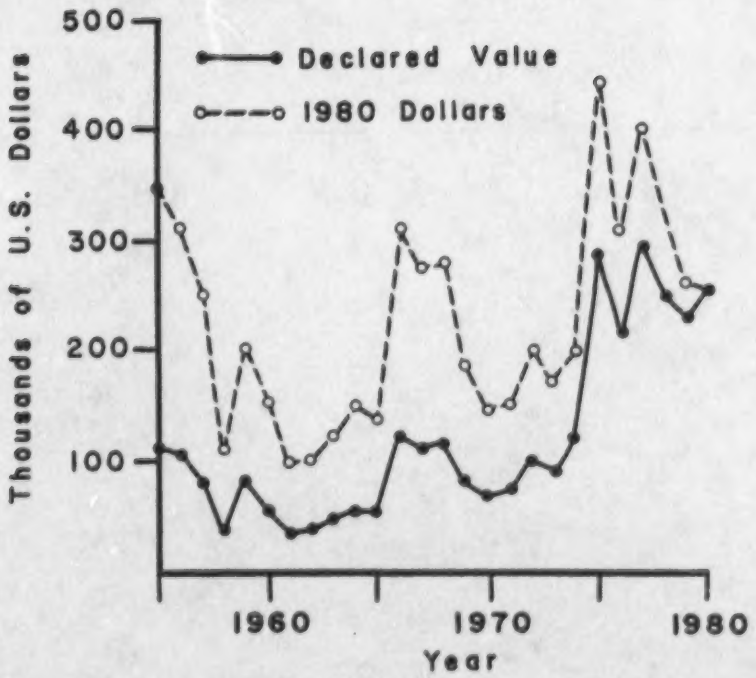


Figure 7c. Orchids.

Table 10
Wholesale Value of Tropical Foliage Plants Purchased in the U.S., 1959-1976.

Year	Millions of U.S. Dollars	Millions of U.S. Constant (1980) Dollars
1959	24.1	68.1
1966	25.2	63.9
1967	26.1	64.4
1968	26.4	62.4
1969	29.2	65.6
1970	27.1	57.5
1971	37.6	76.5
1972	48.4	95.3
1973	68.0	126.1
1974	113.5	189.5
1975	187.2	286.5
1976	235.8	341.3

Source: Nelson, 1978 , Table 1-13, page 14. Values were converted to 1980 U.S. Dollars using the 1980 Economic Report to the President, prepared by the Office of Management and Budget.

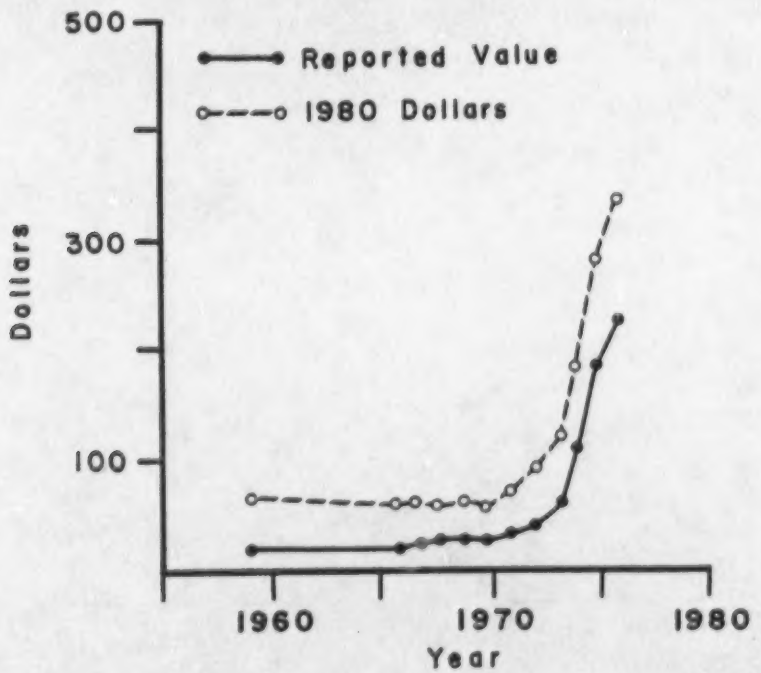


Figure 8. Wholesale Value of Tropical Foliage Plants Purchased in the U.S., 1959-1976, Reported and Constant (1980) U.S. Dollars.

Table 11
U.S. Imports of Cacti and Succulents, Orchids, and Cycads, Showing Major Supplying Regions.

Exporting Region	Number of Cacti and Succulents	%	Number of Orchids	%	Number of Cycads	%
Asia	2,863,045	50	187,118	42	36	<1
Central America	710,690	12	119,699	27	27,241	80
Mexico	939,591	16	49,242	11	4,251	13
Europe	615,342	11	18,644	28	20	<1
Africa	86,154	2	4,474	1	277	1
Australasia	1,224	<1	3,777	1	1,681	5
Mid-east	1,227	<1	0	0	0	0
Canada	4	<1	45	<1	0	0
South America	494,728	9	65,956	15	417	1
TOTAL	5,712,055		448,956		33,923	

Source: Data based on APHIS monthly summaries of plant health permits for 1978-1979. The three ports used to compute these figures (New York, Miami, and Los Angeles) represent approximately 95% of all plant imports (McIntyre, pers. comm.). Note that figures for cacti and succulents may differ when all 14 ports of entry are examined because the major ports for these plants are New York, Brownsville, and San Francisco.

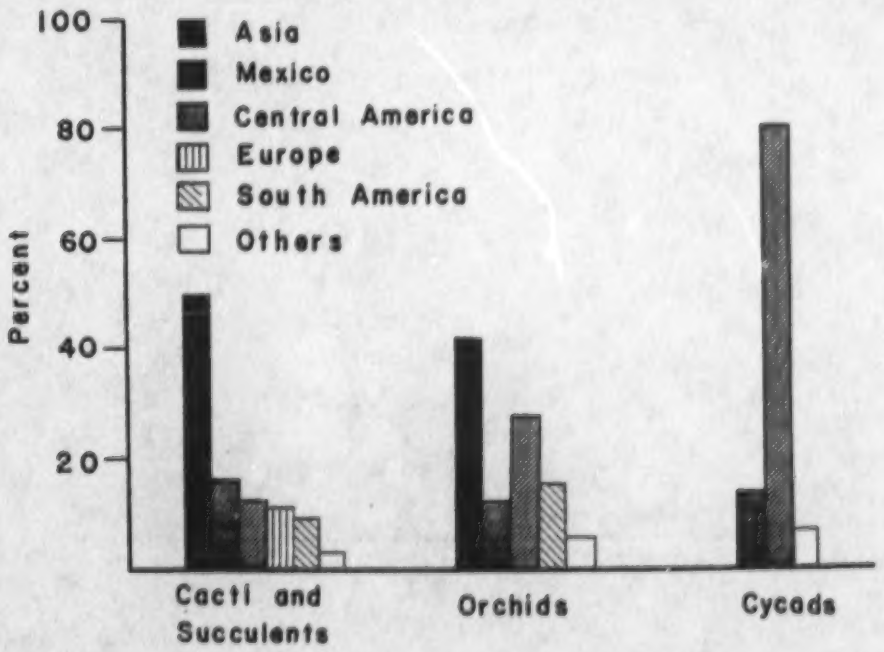


Figure 9. Major Supplying Regions for U.S. Imports of Cacti and Succulents, Orchids, and Cycads.

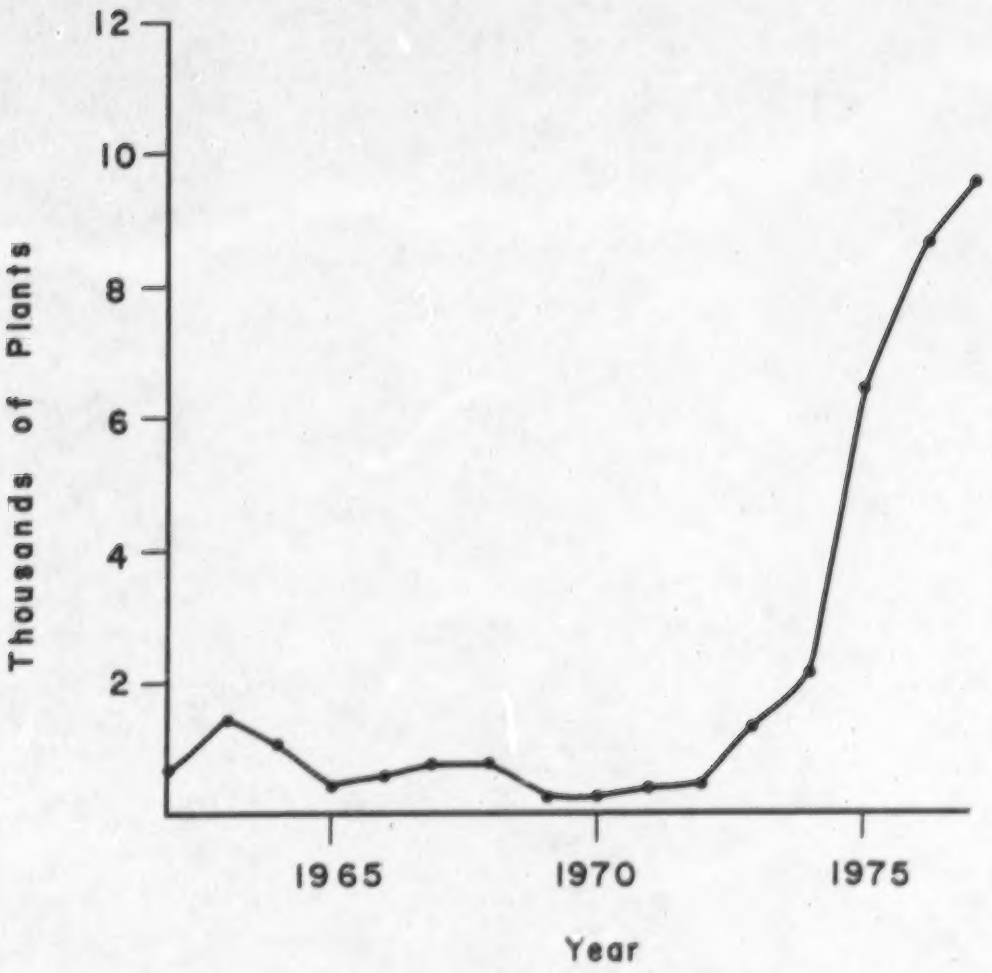


Figure 10. Exports of Orchids of Papua New Guinea, 1962-1977. Redrawn from Kores (1977).

Table 12
Kilograms of Brazilian Orchid Exports, 1974 to 1977.

Importing Country	Kilograms 1974	1975	1976	1977
Argentina	325	0	0	0
Australia	9	26	81	54
Austria	0	8	0	11
Barbados	0	0	0	130
Bahamas	0	0	10	0
Belgium/Luxembourg	0	0	34	18
Canada	0	2	9	12
Chile	0	24	0	0
Denmark	48	42	155	130
W. Germany	285	1,090	951	1,442
Fiji	0	0	2	0
Haiti	0	0	38	0
Indonesia	5	0	0	0
Iran	0	26	0	0
Italy	30	0	139	380
Japan	255	211	1,633	603
Kenya	0	26	0	0
Martinique	3	0	0	0
Mozambique	11	0	0	0
Netherland Antilles	7	14	0	0
Netherlands	320	300	215	320
New Zealand	0	0	0	12
Portugal	20	0	0	0
South Africa	139	342	181	32
Sweden	0	2	31	0
Switzerland	0	0	14	12
Thailand	0	30	0	0
U.S.A.	59	103	68	15
U.K.	1,729	2,387	2,490	2,332
TOTAL	3,245	4,633	6,051	5,503

Source: Commerce Export Data, Brazil.

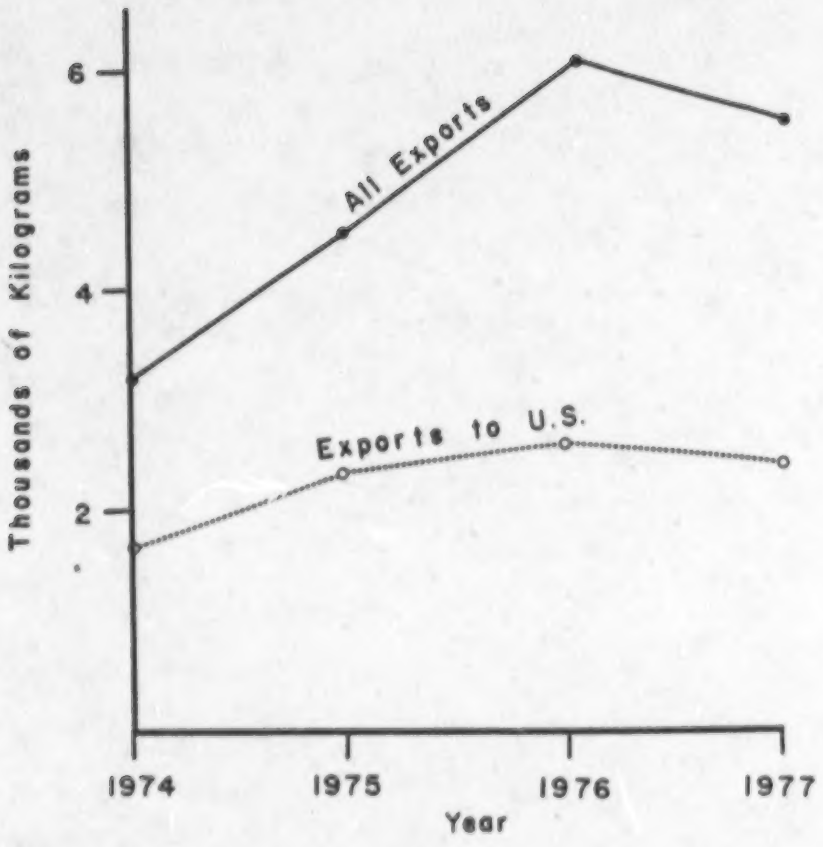


Figure 11. Brazilian Orchid Exports (in kilograms), 1974-1977.

Table 13
U.S. Orchid Imports by Country, 1947-1980. (Table 13a. 1947-1955).

	Exporting Country	1947	1948	1949	1950	1951	1952	1953	1954	1955
C. A. and Caribbean	Mexico	7,961	0	7,584	3,190	60	3,500	965	0	450
	Guatemala	6,813	2,634	3,034	410	938	2,162	1,878	1,375	1,850
	Belize	0	0	0	0	0	0	0	0	0
	Honduras	2,701	0	0	0	0	0	0	0	0
	Nicaragua	0	0	0	0	0	0	0	0	0
	Guyana	0	0	0	0	0	0	0	0	0
	Costa Rica	934	0	3,613	0	200	5,413	184	243	0
	Cayman Islands	0	0	0	0	0	0	0	0	0
	Panama	0	0	0	582	259	250	49	817	0
	Jamaica	0	0	0	0	0	0	113	265	0
	Netherland Antilles	0	0	0	0	0	0	0	0	0
	Cuba	0	0	0	0	0	150	0	0	0
	Haiti	0	0	0	0	0	0	0	0	0
	Trinidad	298	0	0	45	0	0	0	0	0
S.A.	Suriname	0	0	0	0	0	0	0	0	0
	Colombia	61,733	1,175	31,385	2,640	0	4,000	0	0	0
	Argentina	0	0	0	0	0	0	0	0	0
	Venezuela	111,598	680	3,492	33,932	2,081	7,228	11,482	1,401	974
	Ecuador	3,585	0	0	0	0	0	0	0	0
	Peru	200	0	7,548	0	0	0	0	0	0
	Brazil	19,841	0	4,620	2,142	558	1,331	1,821	2,707	568
Europe and Canada	Canada	0	0	0	150	0	12	0	0	0
	U.K.	16,851	0	7,824	8,467	13,780	16,266	28,663	9,083	8,608
	Sweden	0	0	10	0	0	0	0	0	0
	Denmark	0	0	0	0	0	0	0	0	0
	Finland	0	0	0	0	0	0	0	0	0
	Netherlands	1,249	0	1,185	1,358	8,894	10,445	6,678	2,239	718
	Belgium	7,755	0	8,146	11,936	3,602	13,242	10,662	4,724	4,568
	France	5,641	0	290	227	4,087	913	4,733	668	823
	Austria	0	0	0	0	0	0	0	0	0

Table 13a, continued.

	Exporting Country	1947	1948	1949	1950	1951	1952	1953	1954	1955
Europe cont'd	W. Germany	0	0	0	0	9	0	146	0	12
	Italy	0	0	0	0	0	0	0	0	0
	Switzerland	0	0	0	54	0	0	0	0	1,009
	E. Germany	0	0	0	0	0	0	0	0	0
	Azores	0	0	0	0	0	0	0	0	0
	Spain	0	0	0	0	0	0	0	0	0
Asia	India	8,624	953	4,963	1,865	282	410	2,466	0	0
	Sri Lanka	25	0	0	0	117	350	0	0	0
	Burma	0	0	0	0	0	0	0	0	0
	Nepal	0	0	0	0	0	0	0	0	0
	Thailand	1,127	162	2,229	3,731	1,162	116	0	257	981
	Malaysia	57	0	0	178	0	28	0	0	120
	Singapore	0	0	0	0	0	0	0	0	0
	Hong Kong	0	0	0	0	0	0	0	0	0
	Indonesia	0	0	0	100	0	0	0	0	0
	Philippines	7,185	140	256	529	145	30	0	0	0
	Papua New Guinea	0	0	0	0	0	0	0	0	0
	Taiwan	0	0	0	0	0	0	0	0	0
	P.R. China	0	0	0	0	0	0	0	0	0
	Japan	0	3,500	10,010	35,000	0	3,350	5,519	1,318	0
AA	Australia	164	42	232	674	147	221	3,884	134	132
	New Zealand	0	0	0	0	0	0	0	0	0
Africa	Madagascar	0	0	0	0	0	0	0	0	0
	Uganda	0	0	0	0	0	0	0	0	0
	Guinea-Bissau	448	0	0	0	0	0	0	0	0
	Zimbabwe	0	0	0	0	0	0	190	0	0
	Kenya	0	0	0	0	0	0	0	0	0
	S. Africa	240	0	0	0	0	0	0	0	0
	Ivory Coast	0	0	0	0	0	0	0	0	0
	TOTAL	264,790	9,486	96,421	107,410	36,321	69,417	79,352	25,231	20,813

Table 13b. 1956-1964.

	Exporting Country	1956	1957	1958	1959	1960	1961	1962	1963	1964
C.A. and Caribbean	Mexico	700	0	0	3,270	0	358	0	0	332
	Guatemala	515	942	1,300	690	1,107	536	6,493	8,991	1,861
	Belize	0	0	0	0	2,165	5,386	2,500	2,000	8,900
	Honduras	0	1,200	0	1,150	4,300	6,166	0	0	21,025
	Nicaragua	0	0	0	0	0	0	0	0	0
	Guyana	0	0	0	0	0	0	0	0	0
	Costa Rica	0	2,400	2,636	0	0	0	0	322	0
	Cayman Islands	0	0	0	0	0	0	0	0	0
	Panama	200	2,108	775	851	1,098	0	200	250	642
	Jamaica	0	67	0	0	0	0	1,200	0	0
	Netherland Antilles	0	0	0	0	0	0	0	0	0
	Cuba	0	0	0	0	0	0	0	0	0
	Haiti	0	0	0	0	0	0	0	0	0
	Trinidad	0	0	0	0	0	0	0	0	0
S.A.	Suriname	0	0	0	0	2,500	0	0	0	0
	Colombia	0	0	0	0	1,800	1,650	5,850	4,330	19,932
	Argentina	0	0	0	0	0	0	0	0	0
	Venezuela	270	40	0	0	173	0	0	0	0
	Ecuador	0	0	0	0	1,101	0	0	360	0
	Peru	0	0	0	0	7,796	14,676	1,681	172	0
	Brazil	250	270	1,232	1,232	1,420	3,130	5,412	2,488	4,087
Europe and Canada	Canada	0	8,003	0	0	0	250	0	0	0
	U.K.	10,638	10,664	6,174	6,270	6,530	6,046	1,594	3,670	5,377
	Sweden	0	0	0	0	0	0	0	0	0
	Denmark	0	0	0	0	0	0	0	0	0
	Finland	0	0	0	0	0	0	0	0	0
	Netherlands	351	4,860	0	80	0	0	0	0	0
	Belgium	2,555	1,278	906	5,140	2,100	2,870	22	3,900	0
	France	2,194	783	906	5,302	420	587	1,368	2,254	13,453
	Austria	0	0	0	0	0	0	0	0	0

Table 13b, continued.

	Exporting Country	1956	1957	1958	1959	1960	1961	1962	1963	1964
Europe cont'd	W. Germany	19	113	300	0	1,510	0	0	0	326
	Italy	0	0	0	0	0	0	0	125	0
	Switzerland	0	0	0	120	0	0	0	0	0
	E. Germany	0	0	0	0	0	0	0	0	0
	Azores	0	0	0	0	0	0	0	0	0
	Spain	0	0	0	0	0	0	0	0	0
Asia	India	4,500	0	745	11	624	583	8,990	2,908	8,679
	Sri Lanka	0	0	0	0	0	0	0	0	0
	Burma	0	0	0	0	0	0	0	0	0
	Nepal	0	0	0	0	0	0	0	0	0
	Thailand	290	658	119	378	27	205	2,376	3,205	4,258
	Malaysia	0	0	0	0	0	0	0	0	425
	Singapore	0	0	0	0	0	0	315	0	0
	Hong Kong	0	0	0	0	0	0	0	0	0
	Indonesia	0	0	0	0	0	0	0	0	0
	Philippines	0	0	0	622	0	0	0	0	0
	Papua New Guinea	0	0	0	0	0	0	0	0	290
	Taiwan	0	0	0	0	0	0	0	0	0
	P.R. China	0	0	0	0	0	0	0	0	0
	Japan	400	450	2,157	32,483	14,668	48,000	24,450	889	3,400
AA	Australia	38	30	0	0	0	0	0	225	26
	New Zealand	0	0	0	0	0	0	0	0	0
Africa	Madagascar	0	0	0	0	0	0	0	0	0
	Uganda	0	0	0	0	0	0	0	0	0
	Guinea-Bissau	0	0	0	0	0	0	0	0	0
	Zimbabwe	0	0	0	0	0	0	0	0	0
	Kenya	0	0	0	0	0	0	0	0	0
	S. Africa	0	0	0	0	0	0	0	114	0
	Ivory Coast	0	0	0	0	0	0	0	0	0
	TOTAL	22,920	33,866	17,250	57,599	49,339	90,443	63,451	36,203	93,013

Table 13c. 1965-1973.

	Exporting Country	1965 *	1966 *	1967	1968	1969	1970	1971	1972	1973
C.A. and Caribbean	Mexico	--	--	0	0	0	0	700	106,214	2,469
	Guatemala	4,729	--	1,084	955	0	4,024	1,282	710	920
	Belize	--	--	0	0	0	1,800	0	0	0
	Honduras	--	--	5,627	0	2,550	12,092	5,500	7,174	1,500
	Nicaragua	--	--	0	4,100	4,239	0	0	0	0
	Guyana	--	--	0	0	0	0	0	0	0
	Costa Rica	--	--	0	0	0	0	3,000	220	650
	Cayman Islands	--	--	0	0	0	0	0	0	0
	Panama	--	--	0	0	0	0	0	150	250
	Jamaica	--	--	0	0	400	164	140	228	410
	Netherland Antilles	--	--	0	0	0	0	487	0	0
	Cuba	--	--	0	0	0	0	0	0	0
	Haiti	--	--	0	0	0	0	0	5,000	0
	Trinidad	--	--	0	0	0	0	230	204	354
S.A.	Suriname	--	--	0	0	0	0	0	0	0
	Colombia	4,208	--	942	720	188	450	1,227	2,030	1,838
	Argentina	--	--	0	0	0	0	0	0	0
	Venezuela	390	--	0	0	0	125	142	0	153
	Ecuador	--	--	0	1,028	0	0	0	0	0
	Peru	--	--	274	0	0	0	0	75	0
	Brazil	2,381	3,565	6,798	4,130	5,753	2,717	6,313	6,031	8,108
Europe and Canada	Canada	--	--	0	0	0	0	0	303	0
	U.K.	2,275	299	174	1,188	1,417	1,731	2,623	690	3,695
	Sweden	--	--	0	0	0	0	0	110	200
	Denmark	--	--	0	0	0	0	0	0	10,000
	Finland	--	--	0	495	0	0	0	0	0
	Netherlands	--	--	0	0	475	0	630	500	3,100
	Belgium	--	--	2,609	145	63	0	121	848	0
	France	23,238	94,253	99,000	80,854	53,932	23,561	19,319	16,664	9,619
	Austria	--	--	0	0	0	0	0	0	0

*signifies lack of detailed information for the year for this country. All numbers not specified are lumped together under "Other Countries."

Table 13c, continued.

	Exporting Country	1965 *	1966 *	1967	1968	1969	1970	1971	1972	1973
Europe cont'd	W. Germany	--	--	1,936	9,846	0	40	958	8,941	1,474
	Italy	--	--	0	0	0	0	0	0	0
	Switzerland	--	--	0	0	0	11	0	0	1,120
	E. Germany	--	--	0	0	237	0	0	0	0
	Azores	--	--	0	0	0	0	0	0	0
	Spain	--	--	0	0	0	135	0	0	0
Asia	India	8,042	4,627	5,637	5,111	0	3,061	64,828	9,292	19,796
	Sri Lanka	--	--	0	0	0	0	0	0	0
	Burma	--	--	0	0	0	0	0	0	0
	Nepal	--	--	0	0	0	0	0	0	0
	Thailand	1,804	3,387	2,078	7,895	5,121	6,848	2,412	4,500	14,351
	Malaysia	213	--	154	0	200	140	9	237	819
	Singapore	--	--	562	0	0	89	0	225	0
	Hong Kong	--	--	0	2,000	0	0	0	0	0
	Indonesia	--	--	0	0	307	198	100	0	269
	Philippines	--	384	1,056	187	866	337	423	2,889	1,835
	Papua New Guinea	--	--	0	0	0	0	0	0	0
	Taiwan	--	--	245	1,000	10,578	0	7,725	15,200	3,250
	P.R. China	--	--	0	0	0	0	0	0	0
	Japan	--	--	0	0	52	787	1,186	1,866	16,221
AA	Australia	--	--	215	2	0	2,100	33	0	217
	New Zealand	--	--	0	0	0	0	0	0	0
Africa	Madagascar	--	--	14	0	0	0	0	0	0
	Uganda	--	--	0	0	0	0	74	0	0
	Guinea-Bissau	--	--	0	0	0	0	0	0	0
	Zimbabwe	--	--	125	0	0	0	0	0	0
	Kenya	--	--	0	0	0	0	0	0	0
	S. Africa	--	--	0	0	0	0	0	0	0
	Ivory Coast	--	--	0	0	0	0	0	0	0
	Other Countries	7,105	5,323							
	TOTAL	54,385	111,838	128,530	119,656	88,674	60,410	119,462	190,301	102,618

*Signifies lack of detailed information for the year for this country. All numbers not specified are lumped together under "Other Countries."

Table 13d. 1974-1980.

	Exporting Country	1974	1975	1976	1977	1978	1979	1980
C.A. and Caribbean	Mexico	10,136	18,911	21,639	14,759	5,912	7,897	9,188
	Guatemala	1,480	21,694	9,157	9,143	47,261	17,138	8,767
	Belize	685	11,000	3,000	0	21,000	8,500	0
	Honduras	5,375	11,340	13,188	18,083	12,180	11,716	5,897
	Nicaragua	0	0	0	0	594	0	0
	Guyana	0	0	0	0	0	0	600
	Costa Rica	5,541	12,775	7,413	15,725	3,763	5,607	4,000
	Cayman Islands	0	0	0	2,756	1,000	0	0
	Panama	425	0	140	2,070	0	0	271
	Jamaica	915	403	1,037	571	0	0	629
	Netherland Antilles	300	0	0	0	0	0	0
	Cuba	0	0	0	0	0	0	0
	Haiti	0	0	0	0	0	0	0
	Trinidad	422	380	245	175	0	0	0
S.A.	Suriname	0	0	0	330	0	0	0
	Colombia	3,570	5,594	2,594	851	851	2,010	3,296
	Argentina	0	200	0	0	0	0	0
	Venezuela	817	695	819	300	386	1,255	742
	Ecuador	0	1,721	0	1,319	1,585	273	0
	Peru	2,963	400	600	950	7,660	1,845	1,020
	Brazil	17,199	20,218	18,816	29,807	10,546	7,774	11,998
Europe and Canada	Canada	0	0	0	0	0	0	180
	U.K.	4,669	1,498	457	934	823	1,789	2,472
	Sweden	0	50	0	0	0	0	0
	Denmark	225	0	0	0	0	0	0
	Finland	0	0	0	0	0	0	0
	Netherlands	26,941	3,845	3,519	3,427	100	7,722	6,250
	Belgium	1,913	1,629	2,167	0	0	1,295	0
	France	1,233	2,671	611	8,728	22,799	17,525	7,699
	Austria	0	100,000	0	0	0	0	0

Table 13d, continued.

	Exporting Country	1974	1975	1976	1977	1978	1979	1980
Europe cont'd	W. Germany	1,705	2,118	6,036	1,713	5,585	1,797	329
	Italy	0	0	0	1,715	1,000	0	0
	Switzerland	0	0	0	0	0	0	0
	E. Germany	0	0	0	0	0	0	0
	Azores	0	0	0	1,800	0	0	0
	Spain	0	0	0	0	0	0	0
Asia	India	26,001	35,645	80,586	67,449	24,424	3,759	8,752
	Sri Lanka	0	0	0	0	0	0	0
	Burma	0	0	0	0	300	0	0
	Nepal	0	0	0	0	900	0	0
	Thailand	4,232	42,277	55,796	43,647	36,794	26,28[illegible]	21,076
	Malaysia	130	380	10,402	993	999	1,12[illegible]	850
	Singapore	0	3,581	396	135	844	2,[illegible]23	694
	Hong Kong	0	0	0	0	0	0	0
	Indonesia	0	125	1,173	352	270	290	339
	Philippines	2,177	4,194	8,161	14,575	3,894	2,412	12,291
	Papua New Guinea	0	101	401	124	0	0	381
	Taiwan	0	13,862	2,000	99,692	125	1,000	199
	P.R. China	0	0	0	0	0	0	6,800
	Japan	49,861	97,405	29,449	21,453	18,970	70,261	21,395
AA	Australia	1,653	437	448	1,461	2,720	1,449	87
	New Zealand	0	0	0	1,678	0	1	5
Africa	Madagascar	0	0	0	0	366	0	0
	Uganda	0	0	0	0	0	0	0
	Guinea-Bissau	0	0	0	0	0	0	0
	Zimbabwe	0	0	0	0	0	0	0
	Kenya	0	0	0	0	0	0	500
	S. Africa	240	0	660	900	870	100	410
	Ivory Coast	0	0	0	7,200	0	0	0
	TOTAL	171,008	415,149	280,910	374,815	234,521	203,039	137,117

Source: U.S. Imports for Consumption (IM-146), Customs Service, (U.S. Department of Treasury) statistics, compiled by the Bureau of Census, U.S. Department of Commerce.

Table 14
Number of Orchids Exported to the United States from Other Countries. Totals and Percentage of the Trade for Ten-Year Periods of 1971-1980 and 1951-1960.

Country and Region	1971-1980	% of Total	1951-1960	% of Total
Central America				
Mexico	197,825	8.9	8,945	2.2
Guatemala	117,152	5.3	12,757	3.1
Belize	44,385	2.0	0	0
Honduras	91,953	4.1	6,650	1.6
Nicaragua	594	<0.1	0	0
Guyana	800	<0.1	0	0
Costa Rica	58,694	2.6	11,076	2.7
Cayman Islands	3,756	0.2	0	0
Panama	3,306	0.1	6,704	1.6
Jamaica	4,333	0.2	445	0.1
Netherland Antilles	787	<0.1	0	0
Cuba	0	0	150	<0.1
Haiti	5,000	0.2	0	0
Trinidad	2,010	0.1	0	0
SUBTOTAL	531,595		46,727	
South America				
Suriname	330	<0.1	2,500	0.6
Colombia	23,861	1.1	5,800	1.4
Argentina	200	<0.1	0	0
Venezuela	5,309	0.2	23,649	5.7
Ecuador	4,898	0.2	1,101	0.3
Peru	15,513	0.7	7,796	1.9
Brazil	136,810	6.1	11,389	2.8
SUBTOTAL	186,921		52,235	
Canada and Europe				
Canada	483	<0.1	8,015	1.9
United Kingdom	19,650	0.9	116,676	28.3
Sweden	360	<0.1	0	0
Denmark	10,225	0.5	0	0
Netherlands	56,034	2.5	34,265	8.3
Belgium	7,973	0.4	48,777	11.8
France	106,868	4.8	20,829	5.1
Austria	100,000	4.5	0	0
W. Germany	30,656	1.4	2,109	0.5

Table 14, continued.

Country and Region	1971-1980	% of Total	1951-1960	% of Total
Europe, continued				
Italy	2,715	0.1	0	0
Switzerland	1,120	0.1	1,129	0.3
Azores	1,800	0.1	0	0
SUBTOTAL	337,884		231,800	
Asia				
India	340,532	15.3	9,038	2.2
Burma	300	<0.1	0	0
Nepal	900	<0.1	0	0
Thailand	251,366	11.3	3,988	1.0
Malaysia	15,939	0.7	148	<0.1
Singapore	8,098	0.4	0	0
Indonesia	2,918	0.1	0	0
Philippines	52,851	2.4	797	0.2
Papua New Guinea	1,007	<0.1	0	0
Taiwan	143,053	6.4	0	0
P.R. China	6,800	0.3	0	0
Japan	328,067	14.7	60,345	14.6
SUBTOTAL	1,151,831		74,316	
Australasia				
Australia	8,505	0.4	4,586	1.1
New Zealand	1,684	0.1	0	0
SUBTOTAL	10,189		4,586	
Africa				
Madagascar	366	<0.1	0	0
Uganda	74	<0.1	0	0
Zimbabwe	0	0	190	<0.1
Kenya	500	<0.1	0	0
S. Africa	3,180	0.1	0	0
Ivory Coast	7,200	0.3	0	0
SUBTOTAL	11,320		190	
GRAND TOTALS	2,228,940		412,108	

Source: Analysis of U.S. Imports for Consumption (IM-146), based on data collected by the Customs Service, (U.S. Department of Treasury), compiled by the Bureau of Census, U.S. Department of Commerce.

Table 15
Price in U.S. Dollars of Orchid Imports into the United States, 1955 to 1980, Value as Declared and Declared Value in 1980 Dollars.

Year	Number of Orchids Imported	Declared Value		Price per Plant	
		Declared Dollars	1980 Dollars	Declared Dollars	1980 Dollars
1955	20,813	115,381	355,063	5.54	17.06
1956	22,920	104,056	315,491	4.54	13.76
1957	33,866	91,146	266,843	2.69	7.88
1958	17,250	39,264	111,897	2.28	6.49
1959	57,599	72,141	203,360	1.25	3.53
1960	49,339	56,196	156,360	1.14	3.17
1961	90,443	36,811	101,395	0.41	1.12
1962	63,451	38,140	103,895	0.60	1.64
1963	36,203	45,398	122,183	1.25	3.37
1964	93,013	57,577	152,959	0.62	1.64
1965	54,385	54,195	141,537	1.00	2.60
1966	111,838	123,064	312,471	1.10	2.79
1967	128,530	113,142	279,234	0.88	2.17
1968	119,656	118,911	282,186	0.99	2.36
1969	88,674	84,723	190,433	0.96	2.15
1970	60,410	70,232	149,040	1.16	2.47
1971	119,462	74,841	152,273	0.62	1.27
1972	190,301	101,938	200,784	0.54	1.06
1973	102,618	93,917	174,145	0.92	1.70
1974	171,008	123,449	206,278	0.72	1.21
1975	415,149	290,920	445,404	0.70	1.07
1976	280,910	216,311	313,123	0.77	1.11
1977	374,815	297,130	404,031	0.79	1.08
1978	234,521	248,434	313,784	1.06	1.34
1979	203,039	233,816	265,436	1.15	1.31
1980	136,117	258,195	258,195	1.88	1.88

Source: U.S. Imports for Consumption (IM-146), based on data collected by the Customs Service (U.S. Department of Treasury), compiled by the Bureau of Census, U.S. Department of Commerce.

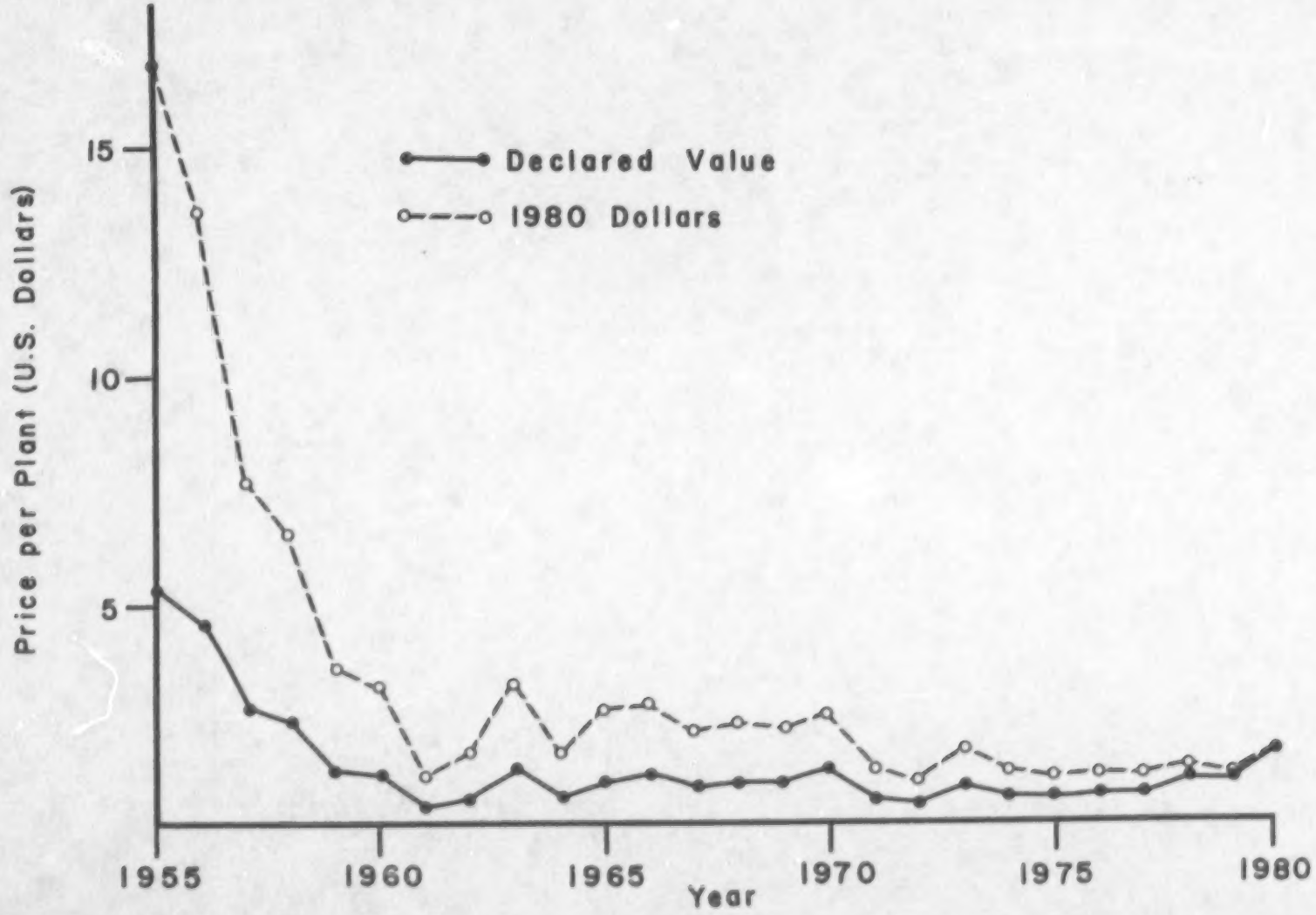


Figure 12. Declared Values of U.S. Orchid Imports, 1955-1980, Reported and Constant (1980) U.S. Dollars.

Table 16
Percent of Species versus Hybrids Illustrated in the American Orchid Society Bulletin, 1950-1979.

Year	Percent Species	Year	Percent Species
1950	44.6	1965	49.5
1951	50.0	1966	44.3
1952	--	1967	49.5
1953	46.2	1968	46.8
1954	39.2	1969	59.4
1955	46.9	1970	71.3
1956	42.0	1971	61.5
1957	45.5	1972	63.4
1958	45.5	1973	70.2
1959	--	1974	76.2
1960	--	1975	70.5
1961	--	1976	71.7
1962	47.8	1977	67.3
1963	47.9	1978	65.2
1964	44.2	1979	62.1

Source: Gibson's analysis of the illustration index in the December issue of each year's American Orchid Society Bulletin, assuming that each species or hybrid was illustrated only once in each issue, and that such illustrations reflect the relative interest of readers in species and hybrids.

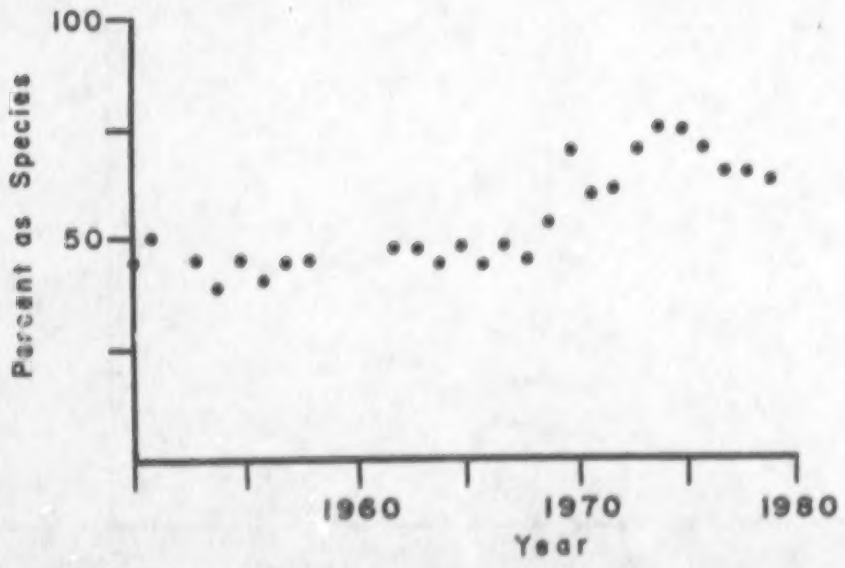


Figure 13. Percent of Species Versus Hybrids Illustrated in the American Orchid Society Bulletin, 1950-1979.

Table 17
U.S. Cactus and Succulent Imports through Fourteen Ports of Entry.

Port of Entry	Number of Shipments Received	Per Cent of Total	Number of Plants Received	Per Cent of Total	Average Number of Plants per Shipment
Fiscal Year 1978 (Oct. 1977-Sep. 1978)					
Brownsville, TX	887		1,504,701	22	1,666
El Paso, TX	70		77,050	1	1,100
Hoboken, NJ	10		376	<1	38
Honolulu, HI	9		5,331	<1	592
JFK Airport, NY	351		779,847	11	2,221
Laredo, TX	170		84,075	1	494
Los Angeles, CA	162		607,530	9	3,750
Miami, FL	285		1,092,902	16	3,835
New Orleans, LA	8		15,727	<1	1,966
Nogales, AZ	87		9,142	<1	105
San Diego, CA	61		11,221	<1	184
San Juan, PR	2		1,010	<1	505
San Francisco, CA	146		2,639,901	38	18,082
Seattle, WA	7		47,190	1	4,448
TOTALS	2,255		6,876,003		
Fiscal Year 1979 (Eight Months only, Oct. 1978-May 1979)					
Brownsville, TX	698		418,282	9	604
El Paso, TX	23		31,509	1	1,370
Hoboken, NJ	8		847	<1	106
Honolulu, HI	3		357	<1	119
JFK Airport, NY	180		634,770	14	3,527
Laredo, TX	92		54,736	1	595
Los Angeles, CA	79		930,799	20	11,782
Miami, FL	224		708,319	15	3,162
New Orleans, LA	0		0	0	0
Nogales, AZ	54		3,276	<1	61
San Diego, CA	10		842	<1	84
San Juan, PR	2		2,000	<1	1,000
San Francisco, CA	77		1,768,147	39	22,963
Seattle, WA	2		33,450	1	16,725
TOTALS	1,454		4,587,334		
Totals for the 20-month period	3,709		11,463,337		3,091

Source: Adapted from an analysis of 20 months of U.S.D.A Summaries by Tarr (1979).

Table 18
Monthly Summaries of U.S. Imports of Cacti and Succulents through the Five Major Ports of Entry.

Month	San Francisco,CA	Miami, FL	Los Angeles, CA	JFK Airport, NY	Brownsville, TX	Total
Fiscal Year 1978						
Oct. 77	348,986	76,868	28,994	33,759	106,468	959,075
Nov. 77	291,263	80,175	202,878	18,249	133,493	726,058
Dec. 77	40,057	44,208	28,413	8,036	56,652	177,366
Jan. 78	156,451	170,021	42,253	53,209	66,577	488,511
Feb. 78	144,215	150,429	109	16,080	91,356	402,189
Mar. 78	256,606	88,597	33,234	17,871	208,935	605,243
Apr. 78	165,898	74,240	69,482	174,876	214,227	698,723
May 78	328,372	181,342	51,038	36,903	239,548	837,203
Jun. 78	225,888	69,682	72,972	100,721	158,823	628,086
Jul. 78	231,005	49,139	25,637	43,754	85,392	434,927
Aug. 78	320,794	67,762	18,368	102,262	58,461	567,647
Sep. 78	130,366	37,439	34,507	120,127	57,769	380,208
Fiscal Year 1979 (8 months only)						
Oct. 78	235,051	91,280	33,544	87,883	38,788	486,546
Nov. 78	241,604	74,957	788,967	61,963	38,901	1,206,392
Dec. 78	108,450	188,952	44,014	33,545	30,005	404,966
Jan. 79	159,454	64,142	3,226	18,037	41,286	286,145
Feb. 79	108,652	50,397	10,519	57,686	68,490	295,738
Mar. 79	186,666	60,860	4,933	74,753	59,292	386,504
Apr. 79	370,640	90,449	25,247	153,887	68,446	708,669
May 79	357,630	87,282	20,349	147,091	76,674	689,026
TOTAL						11,069,222

Source: Adapted from an analysis of 20 months of USDA. Summaries by Tarr (1979). Entries of cacti and succulents into these five ports represents 97% of such imports over the 20 months.

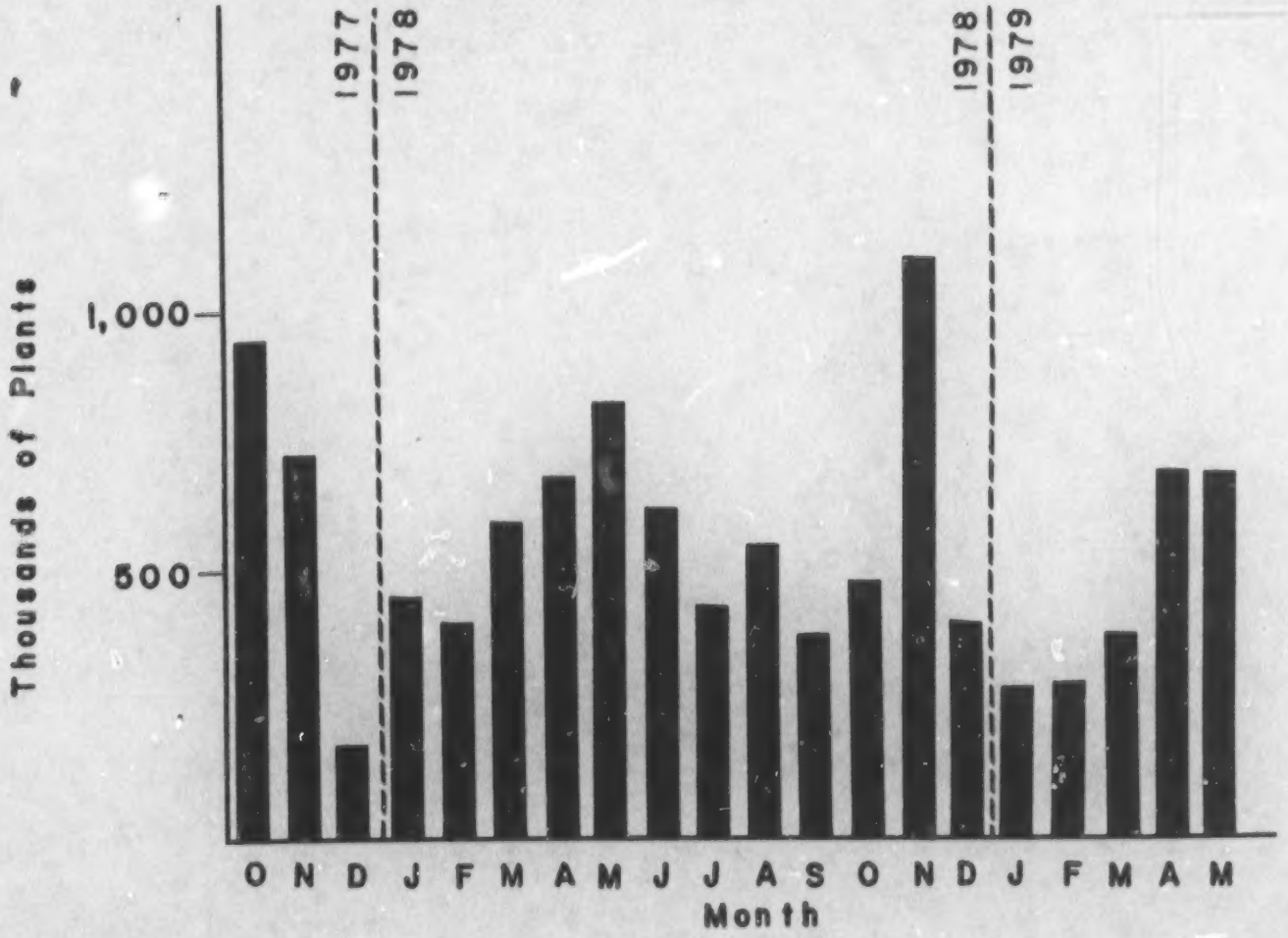


Figure 14. Seasonal Variation in U.S. Imports of Cacti and Succulents through the Five Major Ports of Entry.

Table 19
Breakdown of Countries Supplying Cacti and Succulents to the United States, October 1977 to September 1978.

Region	Regional Total	Country	Number of Cacti and Succulents
Asia	3,223,669	Japan	3,164,056
		Hong Kong	150
		India	95
		Korea	58,630
		Thailand	51
		Singapore	627
		Taiwan	60
Central America and Carribean	2,322,951	Bahamas	18
		Bermuda	12
		British Virgin Islands	10
		Costa Rica	50,965
		Dominican Rep.	533,275
		Guatamala	16,956
		Honduras	32,880
		Mexico	1,688,074
		Netherland Antilles	10
		Jamaica	252
		Panama	184
		Belize	25
		Nicaragua	215
		Cayman Islands	80
Europe	793,345	Denmark	296,500
		Chechoslovakia	25
		England	4,909
		W. Germany	206,656
		Italy	14,969
		Netherlands	299,032
		Spain	2,221
		Sweden	4
		Switzerland	29
Africa	91,743	Ghana	63
		Kenya	73
		Madagascar	344
		Malawi	4
		Rhodesia	571
		South Africa	87,134
		Canary Islands	3,554
Australasia	4,449	Australia	3,405
		New Zealand	44
Middle East	2,560	Israel	2,560
South America	474,390	Argentina	802
		Bolivia	822
		Brazil	467,057
		Chile	871
		Ecuador	10
		Kenya	73
		Peru	2,760
		Suriname	1,832
		Uruguay	119
		Venezuela	44

Source: Analysis of APHIS monthly summaries by Tarr (1979).

Table 20
Reported Exports and Imports of Cacti, 1977-1979, Identification to Family, Genus, or Species.†

Identification Level	1977 Commercial Exports	1978 Commercial Exports	1979 Commercial Exports	1979 Commercial Imports	1979 Noncommercial Imports	Totals*
Number of cacti reported under family name, Cactaceae only (percent of column total)	-- (0%)	876 (37%)	754 (2.6%)	913,132 (97%)	51 (15%)	914,813 (94%)
Number of cacti reported to genus only (percent of column total)	709 (73%)	173 (7%)	1,605 (5.5%)	3,243 (0.3%)	-- (0%)	5,730 (0.6%)
Number of cacti reported as species, subspecies, varieties, or forms (percent of column total)	261 (27%)	1,309 (56%)	26,924 (92%)	25,551 (2.7%)	291 (85%)	54,336 (5.5%)
TOTALS	970	2,358	29,283	941,926	342	974,879

†Data of this type unavailable for 1977 and 1978 imports.

*These figure do not include exports or imports reported as "number of shipments" or "seeds," i.e. percentages are conservative estimates.

Source: Analysis of CITES export and import records in McMahan, 1981a.

Table 21
Approximate Number of CITES-listed Plants Reported as Exports or Reexports, 1977-1979, Listed by Family.

Plant Family	1977	1978	1979
Apocynaceae	--	20	3
Asclepiadaceae	11	2	46
Cactaceae	970	2,360	29,280
Cycadaceae	--	--	3,690
Didiereaceae	--	45	11
Euphorbiaceae	50	300	740
Liliaceae	16	56	10,190
Orchidaceae	1,770	3,000	34,250
Portulacaceae	12	8	--
Zamiaceae	--	--	22
TOTALS	2,829	5,791	78,230

Methods used to determine data in the years 1977 and 1978 may differ slightly from methods used for 1979. This table represents a "start-up" curve for increased reporting efficiency and does not necessarily indicate an increase in actual trade. Numbers above 50 have been rounded off.

Source: Analysis of CITES exports and imports by McMahan, 1981a.

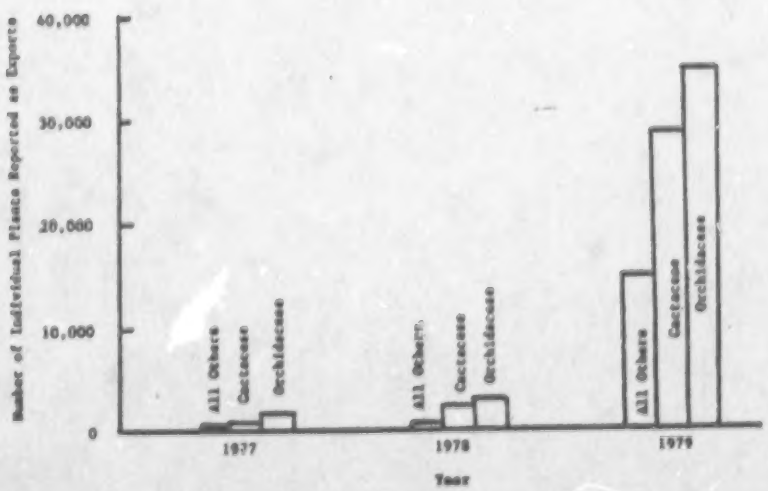


Figure. 15. Increase in Reported CITES Exports from the United States, 1977-1979.

Table 22
U.S. Orchid Imports for 1978. Comparison of CITES and Customs Service Data.

Country	CITES Report	Customs Data
Australia	170 + 1 C	2,720
Bahamas	9	0
Belize	22,672	21,000
Bolivia	5,842 + 14 C	0
Brazil	4,903	10,546
Burma	0	300
Cayman Islands	42	1,000
Costa Rica	655 + 4 S	3,763
Colombia	274 + 9 C	851
Dominican Rep.	150	0
Ecuador	1,799 + 2 C + 2 S	1,585
El Salvador	350	0
France	0	22,799
W. Germany	0	5,585
Grenada	9	0
Guatemala	5,890	47,261
Honduras	7,743	12,180
India	1,294 + 4 S	24,424
Indonesia	0	270
Italy	0	1,000
Jamaica	998 + 2 C + 1 S	0
Japan	145	18,970
Kenya	200 + 2 S	0
Madagascar	240 + 1 C	366
Malaysia	1,080	999
Mexico	11,983 + 20 C + 2 S	5,912
Nepal	2	900
Netherlands	0	100
Papua New Guinea	208	0
Nicaragua	1 S	594
Panama	1,240 + 2 S	0
Paraguay	500 grams	0
Peru	234	7,660
Philippines	100	3,894
Singapore	12	844
S. Africa	33	870
Suriname	1 S	0
Taiwan	0	125
Thailand	37,652	36,794
U.K.	4 + 57 S	823
Venezuela	5	386
TOTALS	105,938 + 500 grams + 49 C + 76 S	234,521

C = carton; S = shipment
Source: A Review of the 1978 U.S. CITES Report, TRAFFIC (U.S.A.), August 25, 1980.

Table 23

U.S. Orchid Imports for 1979. Comparison of CITES, APHIS, and Customs Service Data.

Country of Origin	Customs	APHIS	CITES
Australia	1,449	2,451	408 + 5 S
Bahamas	0	--	1,811
Barbados	0	--	14 S
Belgium	1,295	--	0
Belize	8,500	15,635	23,903 + 1 S
Bolivia	0	--	45
Brazil	7,774	18,032	9,339 + 24 S
Burma	0	0	186
Cayman Islands	0	--	13 + 2 S
Colombia	2,010	6,718	1,336 + 15 S
Costa Rica	5,607	8,028	1,842 + 13 S
Dominican Republic	0	--	500 + 2 S
Ecuador	273	28,189	7,784 + 8 S
El Salvador	0	--	200 + 7 S
France	17,525	--	0
Guatemala	17,138	8,979	3,346
Guyana	0	--	1 S
Honduras	11,716	20,714	14,471 + 30 S
India	3,759	14,755	15,342
Indonesia	290	3,018	1,009
Jamaica	0	--	2,949 + 4 S
Japan	70,261	--	2 S
Kenya	0	--	329 + 13 S
Madagascar	0	1,140	5 + 7 S
Malaysia	1,120	2,013	65 + 4 S
Mexico	7,897	37,812	19,570 + 292 S
Nepal	0	0	303
Netherlands	7,722	--	54
New Zealand	1	0	0
Nicaragua	0	0	4 S
Panama	0	10,211	2,901 + 41 S
Papua New Guinea	0	1,615	605
Peru	1,845	3,086	1,542 + 3 S
Philippines	2,412	16,088	5,745
Singapore	2,223	0	0
Solomon Islands	0	--	3 S
South Africa	100	479	21
Suriname	0	0	1,772
Taiwan	1,000	--	0
Thailand	26,281	77,682	56,198 + 1 S
Uganda	0	--	3 S
U.K.	1,789	--	196
Uruguay	0	--	1 S
Venezuela	1,255	2,720	1,359
W. Germany	1,797	--	6 S
TOTALS	203,041	279,365	175,149 + 506 S

S = shipment; a dash means that APHIS data were not checked. Customs statistics do not include data from shipments with a declared value of less than $250.

Source: U.S. Import for Consumption (IM-146), Customs Service statistics compiled by the Bureau of Census, U.S. Department of Commerce; APHIS monthly summaries for three major ports (representing 95% of plant imports); and 1979 CITES Report, compiled by the Wildlife Permit Office, U.S. Fish and Wildlife Service, U.S. Department of Interior.

Table 24
Volume of CITES-listed plants exported in 1978 Compared with Those Listed as Imports in Other Countries' CITES Reports.

Exporting Country	Importing Country	Type of Plant	Number Reported by Exporting Country	Number Reported by Importing Country
Australia	U.S.A.	orchids	1,063	170 + 1 C
	U.K.		40	140
	Canada		4	0
	Switzerland		20	0
	Japan		405	-
	New Zealand		489	-
	Netherlands		60	-
	Italy		38	0
	Papua New Guinea		158	0
	Others		1,066	-
			3,343	310 + 1 C
Canada	U.S.A.	cacti	4,859	1,759
	U.S.A.	orchids	1,067	0
Costa Rica	U.S.A.	orchids	41	655 + 4 S
	P.R. China	Guiacum sanctum	101 m^3 wood	-
Madagascar	U.S.A.	orchids	1,007	240 + 1 C
	Austria		40	-
	France		1,036	0
	Reunion		172	-
	Mauritius		212	-
			2,467	240 + 1 C
	U.S.A.	Pachypodium	170	0
	W. Germany		4,713 + 17 kg	200
	France		34	0
	Japan		217	-
	Reunion		140	-
	Mauritius		21	-
	Other		16	-
			5,311 + 17 kg	200
	U.S.A.	Euphorbia	110	0
	Japan		147	-
	Mauritius		41	-
	W. Germany		70	0
	France		12	0
			380	0

* Based on permits issued, not actual numbers exported.
S = shipments; C = carton; m = meter; 0 = 1978 Report produced; no data for imports of that plant group. A dash (-) means that no report was produced or the country is not a Party to CITES.
Note: This tables does not include shipments of Panax quinquefolius, American ginseng.

Table 24, continued.

Exporting Country	Importing Country	Type of Plant	Number Reported by Exporting Country	Number Reported by Importing Country
Madagascar (cont.)	U.S.A.	Didiereaceae	10	0
	Mauritius		3	-
			13	0
	France	Aloe	1	0
	Mauritius		98	-
			99	0
Peru	U.S.A.	cacti	11,575 + 75 kg Sd	100 + 20 kg
	U.K.		3,390	4,192
	W. Germany		10,215 + 40 kg	0
	Belgium		450 + 20 kg	-
	Switzerland		200 + 3 kg Sd	0
	Japan		100	-
	Austria		210	-
	Monaco		400	-
	Other		80 + 20 kg + 24 kg Sd	-
			26,620 + 80 kg + 102 kg Sd	4,292 + 20 kg
Seychelles	France	orchids	6 S	0
	W. Germany		4 S	0
	U.K.		1 S	0
	Netherlands		1 S	-
	India		1 S	0
	Italy		2 S	0
	Kenya		5 S	-
	S. Africa		5 S	0
	Zimbabwe		2 S	-
			27 S	0
	S. Africa	cycads	1	0
S. Africa*	U.S.A.	orchids	32	33
	Others	Encephalartos	597	25 (U.S.A.)
	U.S.A.	Aloe	32	119
	U.K.		50	1,000
	Others		151	-
			234	1,119

* Based on permits issued, not actual numbers exported.
Sd = Seeds; S = Shipments
0 = 1978 Report produced; no data for imports of that plant group.
A dash (-) means that no report was produced or the country is not a Party to CITES.

Table 24, continued.

Exporting Country	Importing Country	Type of Plant	Number Reported by Exporting Country	Number Reported by Importing Country
S. Africa (cont.)	W. Germany	Pachypodium	2	0
	W. Germany	Anacampseros	12	0
	U.S.A.		200	0
			212	0
	U.S.A.	Euphorbia	1,472	550
	U.K.		40	5,000
			1,512	5,550
U.K.*	Denmark	cacti	2,073	0
	W. Germany		650	0
	U.S.A.		273	0
	Others		950	-
			3,946	0
	W. Germany	Euphorbia	8	0
	U.S.A.	orchids	13	4 + 57 S
	Italy		126	0
	Australia		61	0
	W. Germany		62	0
	Others		155	-
			418	4 + 57 S
U.S.A.	Australia	orchids	206	0
	Canada		636	0
	P.R. China		3,165	-
	West Indes		228	-
	Colombia		232	-
	Dominican Rep.		266	-
	El Salvador		397	-
	Venezuela		1,619	-
	Netherlands		244	-
	W. Germany		355	0
	Italy		273	0
	U.K.		250	3,520
	Peru		4	0
	Panama		32	-
	Costa Rica		257	0

* Based on permits issued, not actual numbers exported
S = shipment
0 = 1978 Report produced; no data for imports of that plant group
A dash (-) means that no report was produced or the country is not Party to CITES.

Table 24, continued.

Exporting Country	Importing Country	Type of Plant	Number Reported by Exporting Country	Number Reported by Importing Country
U.S.A. (cont.)	S. Africa		198	0
	Indonesia		211	-
	Philippines		357	-
	Thailand		322	-
	Japan		4,343	-
	Others		2,284	30
			15,848	3,550
U.S.A.	Canada	cacti	3,895	0
	W. Germany		93	0
	U.K.		459	7,044
	Peru		74	0
	S. Africa		81	0
	Other		549 + 1 S	-
			5,151 + 1 S	7,044
	U.K.	succulents	1,013	0

S = shipment
0 = 1978 Report produced; no data for imports of that plant group.
A dash (-) means that no report was produced or the country is not Party to CITES.

Source: Trade Statistics for the Year 1978, Draft, compiled by the Wildlife Trade Monitoring Unit, submitted to the CITES Secretariat as of February 1981.

Table 25
Volume of CITES-Listed Plants Exported in 1979 Compared with Those Listed as Imports in Other Countries' CITES Reports.

Exporting Country	Importing Country	Type of Plant	Number Reported by Exporting Country	Number Reported by Importing Country
Australia*	U.S.A.	orchids	573	408 + 5 S
	Thailand		46	-
	U.K.		3	-
	Belgium		60	-
	Papua New Guinea		105	0
	S. Africa		17 + 10 F	0
	New Zealand		131 + 110 F	-
	Netherlands		66 + 64 F	-
	Japan		210 + 15 F	-
			1,211 + 199 F	408 + 5 S
	U.S.A.	cycads	66 + 100 CUT	0
	Italy		33	0
			99 + 100 CUT	0
	U.S.A.	Zamiaceae	2,331	0
	Italy		10	0
			2,341	0
Canada*	Denmark	cacti	46,000	0
	U.S.A.		321,619	283,911
			366,619	283,911
	Australia	orchids	29	0
	Bermuda		6	0
	S. Africa		11	0
	U.K.		40	-
	U.S.A.		2,951	0
			3,037	0
Chile	Unknown	Fitzroya cupressoides	5,609	0
F.R. Germany*	Finland	orchids	1	-
	U.S.A.	Pachypodium	60,000 Sd	34 + 12 S

* - Based on permits issued, not actual numbers exported
S = Shipment; F = Flower; CUT = Cutting; Sd = Seed
0 = 1979 Report produced; no data for imports of that plant group.
A dash (-) means that no report was produced or the country is not a Party to CITES.

Note: This table does not include trade in American ginseng (Panax quinquefolius).

Table 25, continued.

Exporting Country	Importing Country	Type of Plant	Number Reported by Exporting Country	Number Reported by Importing Country
India*	Japan	orchids	34,466	0
	Australia		1,501	0
	U.K.		1,816	-
	W. Germany		7,579	2,970
	Canada		239	-
	U.S.A.		14,070	15,342
	Sweden		32	0
	France		1,156	-
	Reunion		219	-
	Italy		2,924	0
	Switzerland		495	0
	Denmark		472	0
	New Zealand		1,129	-
	Mauritius		150	-
	The Caribbean		1,000	-
			67,248	18,312
Madagascar	France	orchids	318	-
	Italy		207	0
	Japan		260	-
	Reunion		136	-
	U.S.A.		551	5 + 7 S
	W. Germany		467	0
	Others		122	-
			2,061	5 + 7 S
	France	Pachypodium	47	-
	Italy		121	0
	Japan		179	-
	U.S.A.		339	335
	W. Germany		2,010 + 1 kg	0
	Others		31	-
			2,727 + 1 kg	335
	France	Euphorbia	105	-
	Japan		135	-
	Italy		31	0
	U.S.A.		350	357
	U.K.		191	-
	Others		18	-
			830	357

* - Based on permits issued, not actual numbers exported
S = Shipment.
0 = 1979 Report produced; no data for imports of that plant group
A dash (-) means that no report was produced or the country is not a Party to CITES.

Table 25, continued.

Exporting Country	Importing Country	Type of Plant	Number Reported by Exporting Country	Number Reported by Importing Country
Madagascar (cont.)	Italy	Aloe	47	0
	U.S.A.		42	42
	Others		14	-
			103	42
	Italy	Didieraceae	19	0
	Reunion		11	-
	U.S.A.		29	39
			59	39
	Italy	Cycas	10	0
	France	Cyathea	9	-
Peru	U.S.A.	cacti	5,960 + 8 kg Sd	3,720 + 1 S
	U.K.		2,500	-
	Canada		5,000	0
	W. Germany		9,450	100
	Switzerland		1,140	0
	Denmark		8,920 + 2 kg Sd	0
	Belgium		230	-
	Chile		950 kg + 60 C	-
	France		3,500	-
	Thailand		160	-
	Others		90 + 2 kg Sd	-
			35,750 + 7.8 kg Sd + 60 C	3,820 + 1 S
	U.S.A.	orchids	1,048	1,542 + 3 S
South Africa*	U.S.A.	Encephalartos	537 + 1,410 Sd	2,063 + 1,605 Sd
	W. Germany		69	0
	Denmark		63	0
	U.K.		125	-
	Netherlands		21 + 41 Sd	-
	New Zealand		240 Sd	-
	Philippines		50 Sd	-
	Reunion		81	-
	Others		68	-
			964 + 1,741 Sd	2,063 + 1,605 Sd

* Based on permits issued, not actual numbers exported.
S = Shipment; Sd = Seed; C = Carton
0 = 1979 Report produced; no data for imports of that plant group.
A dash (-) means that no report was produced or the country is not a Party to CITES.

Table 25, continued.

Exporting Country	Importing Country	Type of Plant	Number Reported by Exporting Country	Number Reported by Importing Country
S. Africa (cont.)	U.S.A.	Stangeria	57 + 10 Sd	32
	Others		3	-
			60 + 10 Sd	32
	Netherlands	cacti	1,753	-
	U.K.		2,600	-
	W. Germany		3,400	0
			7,753	0
	Australia	Euphorbia	75	0
	U.S.A.		905	5,615 + 3 S + 568 CUT
	Netherlands		2,876	-
	Switzerland		186	0
	U.K.		240	-
	Belgium		1,850	-
	W. Germany		1,484	0
			7,619	5,615 + 3 S
	U.S.A.	Aloe	291	275
	Switzerland		50	0
			341	275
	U.S.A.	Pachypodium	12	605 + 1 S Sd
	Australia		6	0
			18	605 + 1 S Sd
	U.S.A.	Anacampseros	205	190
	W. Germany		100	0
	Netherlands		30	-
			335	190
	U.S.A.	orchids	73	21
	S. America		22	-
			95	21
	U.S.A.	Cycas	55	34
	U.K.		60	-
	Other		25	-
			140	34
	U.S.A.	Dioon	9	5
	U.K.		25	-
	Other		7	-
			41	5

* Based on permits issued, not actual numbers exported.
S = Shipment; Sd = Seed; CUT = Cutting.
0 = 1979 Report produced; no data for imports of that plant group
A dash (-) means that no report was produced or the country is not a Party to CITES.

Table 25, continued.

Exporting Country	Importing Country	Type of Plant	Number Reported by Exporting Country	Number Reported by Importing Country
S. Africa (cont.)	U.S.A.	Zamiaceae	68	55
	U.K.		25	-
	New Zealand		50 Sd	-
	Others		5	-
			98 + 50 Sd	55
Switzerland	S. Africa	orchids	12	0
U.S.A.	S. Africa	cacti	1 + .2 kg Sd	0
	U.K.		27,518 + 136,000 Sd	-
	Canada		1,604 + 19,000 Sd + 1.3 kg Sd	0
	Australia		10 + 24 Sd	0
	W. Germany		9,038 + 369,999 Sd + 4.0 kg Sd	0
	Belgium		5,122 + .5 kg Sd	-
	Japan		5,650 + 33,700 Sd + .2 kg Sd	-
	Others		6,238 + 2,565 Sd	-
			50,059 + 561,288 Sd + 6.1 kg Sd	0
	S. Africa	orchids	320	0
	Costa Rica		260	0
	U.K.		652	-
	Canada		1,729 + 234F + 1S	0
	Australia		654	-
	W. Germany		743	336
	Colombia		944	-
	Japan		4,766	-
	Netherlands		2,413	-
	Sweden		16,069	-
	Taiwan		2,159	-
			36,024 + 248 F + 1 S	336
	U.K.	Euphorbia	35	-
	Canada		236	0
	F.R. Germany		74	0
	France		23	-
	Netherlands		179	-
	Other		152	-
			699	0
	S. Africa	Encephalartos	3	-

Sd = Seed; F = Flower
0 = 1979 Report produced; no data for imports of that plant group.
A dash (-) means that no report was produced or the country is not a Party to CITES.

Table 25, continued.

Exporting Country	Importing Country	Type of Plant	Number Reported by Exporting Country	Number Reported by Importing Country
U.S.A. (cont.)	Canada	Aloe	29	0
	U.K.		29	-
	W. Germany		8	0
	Philippines		143 kg	-
	Spain		10,000 + 17,898 kg	-
	Switzerland		5	-
	Others		120	-
			10,191 + 18,041 kg	0
	Canada	Pachypodium	3	-
	Canada	Zamiaceae	1	0
	U.K.		12	-
	S. Africa		1	0
			14	0
	Canada	Dioon	1	0
	U.K.		3	-
	S. Africa		1	0
			5	0
	Canada	Ceropegia	1	0
	U.K.		7	-
	F.R. Germany		3	0
	France		1	-
	Netherlands		12	-
	Switzerland		2	0
	Other		18	-
			44	0
	Canada	Didiereaceae	3	0
	U.K.		1	-
	France		3	-
	Japan		100 Sd	-
	Switzerland		3	-
			10 + 100 Sd	0

Sd = Seed
0 = 1979 Report produced; no data for imports of that plant group.
A dash (-) means that no report was produced or the country is not a Party to CITES.

Source: 1979 Import Data from CITES Annual Reports of Australia, Canada, Chile, India, Madagascar, Peru, South Africa, Switzerland, United States, and West Germany.

Table 26
Volumes of CITES-Listed Plants Imported in 1978 Compared with Those Listed as Exports in Other Countries' CITES Reports.

Importing Country	Exporting Country	Type of Plant	Number Reported by Importing Country	Number Reported by Exporting Country
Canada	S. Africa	cycads	1 Cone & Sd	-
	S. Africa	Welwitschia	1 Sd	-
W. Germany	Colombia	orchids	200	-
	India		500	0
	Thailand		19,140	-
	Costa Rica		85	0
	Brazil		820	-
	Indonesia		345	-
	Honduras		970	-
			22,060	0
	S. Africa	Encephalartos	4	0
	Madagascar	Pachypodium	200	4,713 + 17 kg
Seychelles[1]	Australia	orchids	1 S	0
	France		2 S	0
	Honduras		1 S	-
	India		350	0
	Indonesia		50	-
	Madagascar		1 S	0
	Mauritius		1 S	-
	Singapore		2 S	-
	Thailand		1 S	-
	U.S.A.		30	0
			12 S	
U.K.	W. Germany	Pachypodium	509	--
	S. Africa		500	0
			1,009	0
	Austria	cacti	158	-
	U.S.A.		7,044	459
	Peru		4,192	3,390
	W. Germany		260	0
	Mexico		210	-
	Israel		7,517	-
	Malta		4,490	-
	Uruguay		558	0
	Brazil		901	-
	Belgium		638	-
	Spain		499	-
	Others		691	-
			27,258	3,849

[1] Seychelles data from May 1977 through December 1978.
S = Shipment; Sd = Seed
0 = 1978 Report produced; no data for exports of that plant group
A dash (-) means that no report was produced or the country is not a Party to CITES.
Note: This table does not include trade in American ginseng (Panax quinquefolius).

Table 26, continued.

Importing Country	Exporting Country	Type of Plant	Number Reported by Importing Country	Number Reported by Exporting Country
U.K. (cont.)	Thailand	orchids	2,732	-
	Guatemala		5,137	-
	Greece		413	-
	Costa Rica		400	0
	Brazil		853	-
	Australia		140	40
	U.S.A.		3,520	250
	W. Germany		538	0
	Honduras		3,550	-
	Indonesia		327	-
	India		15,044	0
	Mexico		7,885	-
	Philippines		1,300	-
	Others		1,933	30 + 1 S
			43,772	320 + 1 S
	S. Africa	Euphorbia	5,000	40
	U.S.A.		700	0
	Brazil		110	-
	Spain		216	-
	W. Germany		156	0
			6,182	40
	U.S.A.	Zamia	3	0
	Mauritius	Aloe	1,000	-
	S. Africa		1,000	10
	U.S.A.		400	0
	Others		12	-
			2,415	10
	Belgium	Cyclamen	3,000	-
	Trinidad		1,912	-
	Greece		460	-
	Italy		8,000	0
	Netherlands		59,982	-
	Others		34	-
			73,388	0
U.S.A.	Canada	cacti	1,759	4,859
	Domin. Rep.		30,418	-
	Guatemala		2,000 + 1 S	-
	Mexico		144,607 + 19 S + 28 C	-
	Peru		100 + 20 kg	11,535 + 75 kg
	Others		1,672 + 3 S + 72 C	-
			180,556 + 23 S + 100 C + 20 kg	16,394 + 75 kg

S = Shipment; C = Carton
0 = 1978 Report produced; no data for exports of that plant group
A dash (-) means that no report was produced or the country is not a Party to CITES.

Table 26, continued.

Importing Country	Exporting Country	Type of Plant	Number Reported by Importing Country	Number Reported by Exporting Country
U.S.A. (cont.)	Australia	orchids	170 + 1 C	1,063
	U.K.		4 + 57 S	13
	Peru		234	0
	Panama		1,240 + 2 S	0
	Madagascar		240 + 1 C	1,007
	Costa Rica		655 + 4 S	251 + 4 S
	S. Africa		33	27
	Belize		22,672	-
	Bolivia		5,842 + 14 C	-
	Brazil		4,903	-
	Ecuador		1,799 + 2 C + 2 S	-
	Guatemala		5,890	-
	Honduras		7,743	-
	Mexico		11,983 + 20 C + 2 S	-
	Thailand		37,652	-
	Others		4,654 + 11 C + 9 S + .5 kg	2,367
			105,714 + 49 C + 76 S + .5 kg	4,728 + 4 S
	Domin. Rep.	Cycadaceae	3,225	-
	Others		16	-
			3,241	0
	Guatemala	Cyathea	12,198 + 27 m^3	-
	Mexico		225	-
			12,423 + 27 m^3	0
	S. Africa	Dioscorea	1	0
	Domin. Rep.	Euphorbia	59,865	-
	Mexico		2,350	-
	Guatemala		750	-
	S. Africa		551	0
	W. Germany		60	0
	Others		202	-
			63,778	0
	S. Africa	Aloe	119	33
	S. Africa	Zamiaceae	2	0
	Domin. Rep.		11,980	-
	Costa Rica		15	0
			11,997	0
	W. Germany	Pachypodium	3,210	0
	S. Africa		2	0
			3,212	0

S = Shipment; C = Carton; m = meter
0 = 1978 Report produced; no data for exports of that plant group
A dash (-) means that no report was produced or the country is not a Party to CITES.

Source: Trade Statistics for the Year 1978, Draft, compiled by the Wildlife Trade Monitoring Unit, submitted to the CITES Secretariat, February 1981.

Table 27
Volume of CITES-Listed Plants Imported in 1979 Compared with Those Listed as Exports in Other Countries' CITES Reports.

Importing Country	Exporting Country	Type of Plant	Number Reported by Importing Country	Number Reported by Exporting Country
West Germany*	Brazil	orchids	1,300	-
	Costa Rica		1,152	0
	Sri Lanka		2,000	-
	France		500	-
	Guatemala		1,505	-
	Honduras		1,700	-
	India		2,970	7,579
	Colombia		200	-
	Mexico		200	-
	Papua New Guinea		120	0
	Philippines		1,420	-
	Singapore		20	-
	Thailand		7,563	-
	U.S.A.		336	743
			20,986	8,322
	Peru	cacti	100	8,920 + 2 kg Sd
	Bolivia		175	-
			275	8,920 + 2 kg Sd
U.S.A.	Australia	orchids	408 + 5 S	573
	Mexico		19,570 + 292 S	-
	U.K.		196	-
	South Africa		21	73
	Madagascar		5 + 7 S	551
	Costa Rica		1,842 + 13 S	0
	India		15,342	15,342
	Peru		1,542 + 3 S	1,048
	Belize		23,903 + 1 S	-
	Brazil		9,339 + 24 S	-
	Ecuador		7,784 + 8 S	-
	Guatemala		3,346	-
	Honduras		14,471 + 30 S	-
	Panama		2,901 + 41 S	-
	Papua New Guinea		605	0
	Philippines		5,745	-
	Thailand		56,198 + 1 S	-
	Others		21,886 + 89 S	-
			175,104 + 514 S	17,587
	Mexico	Zamiaceae	1,050 + 1 S	-
	S. Africa		55	68
	Costa Rica		150 + 8 S	0
	Dominican Rep.		17,345 + 100 S	-
	Others		40 + 2 S	-
			18,640 + 111 S	68

* Data based on permits issued, not actual numbers exported.
S = Shipment; Sd = Seed.
0 = 1979 Report produced; no data for imports of that plant group.
A dash (-) means that no report was produced or the country is not a Party to CITES.
Note: This table does not include trade in American ginseng (Panax quinquefolius).

Table 27, continued.

Importing Country	Exporting Country	Type of Plant	Number Reported by Importing Country	Number Reported by Exporting Country
U.S.A. (cont.)	Mexico	cacti	289,063 + 120 S + 14 S Sd	1,000
	Canada		283,911	321,619
	Peru		3,720 + 1 S	5,960 + 8 kg Sd
	S. Africa		3	0
	U.K.		63	-
	Costa Rica		32	0
	Brazil		10,000 + 33 S	-
	Dominican Rep.		219,104 + 18 S	-
	Japan		135,450	-
	Others		598 + 41 S	-
			941,944 + 213 S + 14 S Sd	328,579 + 8 kg Sd
	U.K.	Pachypodium	18	-
	S. Africa		605 + 1 S Sd	12
	Madagascar		335	339
	W. Germany		34 + 12 S	60,000 Sd
			992 + 12 S + 1 S Sd	351 + 60,000 Sd
	Mexico	Euphorbia	300	-
	U.K.		10	-
	S. Africa		5,615 + 3 S + 568 CUT	905
	Madagascar		357	350
	Japan		1,000	-
	Dominican Rep.		238,475 + 47 S	-
	W. Germany		13 + 5 S	0
	Others		10 + 6 S	-
			245,780 + 61 S +568 C	1,255
	S. Africa	Aloe	275	291
	Japan		300	-
	Madagascar		42	42
	W. Germany		1 + 2 S	0
	Others		1 S	-
			618 + 3 S	333
	Guatemala	Cyatheaceae	1,590 + 110 C + 1 S	-
	India		710	0
	Others		65 + 2 S	-
			2,365 + 110 C + 3 S	0

S = Shipment; Sd = Seed; C = Carton; CUT = Cutting
0 = 1979 Report produced; no data for imports of that plant group.
A dash (-) means that no report was produced or the country is not a Party to CITES.

Table 27, continued.

Importing Country	Exporting Country	Type of Plant	Number Reported by Importing Country	Number Reported by Exporting Country
U.S.A. (cont.)	Colombia	palms	5 S	-
	Mexico	cycads	5,452 + 2 Sd	-
	Domin. Rep.		18,290 + 112 S	-
	S. Africa		39	55
	Others		1 + 4 S + 235 Sd	-
			23,782 + 237 Sd + 116 S	55
	S. Africa	Encephalartos	2,063 + 1,605 Sd	537 + 1,410 Sd
	Kenya		309 Sd	-
			2,063 + 1,914 Sd	537 + 1,410 Sd
	Madagascar	Didiereaceae	39	0
	S. Africa	Anacampseros	190	205

S = Shipment; Sd = Seed
0 = 1979 Report produced; no data for imports of that plant group
A dash (-) means that no report was produced or the country is not a Party to CITES.

Source: 1979 CITES Annual Reports from the United States and West Germany.

Chapter IV

Legislation and Enforcement

This chapter discusses legislation and enforcement in the United States and related problems. The discussion here may also help other countries that are currently formulating legislation or enforcement programs. First, we will discuss laws and enforcement mechanisms and then rationales for monitoring and controlling the plant trade. The end of this chapter documents U.S. enforcement problems.

A. U.S. Legislation and Enforcement

Our data indicate that the international trade in plants increased dramatically during the 1970's and in some cases may be seriously depleting wild populations of rare species. Concern over the effect of trade on rare species has led countries to ratify international treaties and to formulate national and local legislation intended to regulate this trade. Our report will focus on both domestic legislation in the United States and on the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

Legislation

The U.S. Endangered Species Act (ESA), which since 1973 has included plant species, prohibits all interstate or foreign commerce in listed species, except by special permits. It does not, however, prohibit field-collection of a listed plant. As of October 1981, there are 63 plant taxa designated as "endangered" or "threatened" under the ESA; 21 of these are cacti. The only insectivorous plant currently listed as "endangered" is Sarracenia oreophila, the green pitcherplant. Further, at least 23 states also have native plant conservation laws (McMahan, 1980). Of these, Arizona is most vigorously enforcing its law protecting cacti native to that state. But despite the efforts of Arizona's six agents, which led to 91 arrests and 47 convictions in 1979, an estimated $300,000 to $1,000,000 worth of cacti are "rustled" across State borders each year (Pew, 1978). California, Nevada, New Mexico, and Texas now also have laws or regulations governing collection of cacti. Florida and North Carolina have enacted collecting permit systems. Florida's law protects 30 species including several bromeliads, epiphytic orchids, and pitcher plants. State laws generally regulate collecting of listed plants from public lands or from private property owned by someone other than the collector.

In late 1981, Congress amended the Lacey Act to include some plant species. The Lacey Act makes it a federal crime to violate state conservation laws when interstate or international transport is involved. The act limits protection to plants native to the United States and (1) specifically listed under a state endangered species law, or (2) listed on the CITES Appendices.

Treaties

CITES, which came into force in 1975, controls international trade in listed plants and animals. Another treaty, the Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere (1941) has the potential to regulate trade but has so far been poorly implemented.
CITES Appendix I lists species which are considered to be threatened with extinction in the wild. Commercial trade in these species is prohibited; field-collected specimens may be traded internationally only for non-commercial purposes which are not detrimental to the survival of the species. Appendix II lists species which the Parties believe may be threatened with extinction if the export is not controlled, or for which trade controls may be necessary to protect species similar in appearance that are listed in Appendices I or II. Appendix III contains species which individual countries protect nationally and for which they seek international assistance in regulating trade.

Presently, the Appendices include nine entire plant families, 16 listed genera, and over 80 species. Protected families are Cactaceae, Chloanthaceae, Cycadaceae, Dicksoniaceae, Didiereaceae, Orchidaceae, Stangeriaceae, Welwitschiaceae, and Zamiaceae. From among the families listed, nine species of orchids, seven species of cacti, one genus and one species of cycad, six species of African succulents, and four species of insectivorous plants are listed on Appendix I.

U.S. CITES Implementation

Each country that is party to CITES is responsible for designating a Management Authority and a Scientific Authority. The functions of the U.S. Scientific Authority are carried out by the Office of the Scientific Authority (OSA) in the U.S. Fish and Wildlife Service, Department of the Interior. OSA employs one professional botanist to review export and import permits and help determine U.S. policy relating to CITES. OSA is aided in its determinations by an autonomous board, the International Convention Advisory Commission (ICAC).

The U.S. Management Authority (U.S. Fish and Wildlife Service), functions are carried out by the Federal Wildlife Permit Office (WPO). An applicant wishing to obtain a CITES import or export permit first contacts the Wildlife Permit Office, which then seeks review and approval from OSA and other federal offices with review functions.

Enforcement

The U.S. Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) has the authority to regulate trade in non-marine plants. Prior to CITES, APHIS already operated a plant import inspection program designed to prevent agricultural pests and disease from being introduced into the United States. APHIS may soon to hire botanists trained in plant identification to be located at quarantine stations and other important ports of entry. Regulations are currently being drafted for designating

ports through which CITES-protected plants may be imported or exported, and to license businesses that export or import CITES plants.

The implementation of CITES requires close cooperation among several autonomous agencies. The U.S. Customs Service (Department of Treasury), is normally the first agency to inspect incoming shipments. APHIS then has responsibility for inspecting and clearing plant shipments. The Wildlife Permit Office of the U.S. Fish and Wildlife Service compiles records and trade statistics. The Department of Justice, which has jurisdiction over prosecution of violations of conservation laws, is involved only when there is a possible violation. The lack of standardization and discrepancies (see Tables 22 and 23) in reporting plant import and export data by the different agencies causes problems in assessing the trade.

B. Rationale for Legislation and Enforcement

One rationale for trade controls include monitoring and documenting trade in plants to determine the possible effects of trade on plant species long before they actually become rare. For rare plant species, trade controls serve to regulate flow in commerce. Other reasons include controlling the spread of exotic "weeds," and plant pests and diseases.

Regulating Trade in Possibly Rare Plants

CITES data and reports from Parties already show extensive trade in rare plants. Some of the plants are artificially propagated; indeed, most are shipped under artificial propagation exemption permits (see Appendix A). However, anecdotal accounts and information supplied by authors McCarten and Gibson indicate that many plants in international trade may be field-collected. Although habitat destruction may significantly affect most rare species, trade is affecting wild populations of certain rare species, and may be the the major threat for some.

Cacti and Succulents

There are numerous reports in the scientific and popular literature of the effects of commercial collecting on rare species, especially for slow-growing cacti and succulents. Despite their ease of propagation, rare cacti are field-collected for commercial purposes and include: Astrophytum myriostigma (bishop's cap), A. ornatum (star cactus), and Leuchtenbergia principis (prism cactus) from Mexico (Vovides and Gomez-Pompa, 1977), Copiapoa (pincushion cacti) species from Chile (Pizarro, 1977), Melocactus (melon cacti) species from the Caribbean islands (Howard, 1977; Martin and Farmer, 1975), Lobivia (cob cacti), Rebutia (crown cacti), and Parodia species from Argentina (Cabrera, 1977), and Epithelantha (button cacti), Echinocereus (hedgehog cacti), and Ancistrocactus species from the Southwestern U.S. (Lyons, 1979; 1980).

The numbers of cacti collected annually are not known but estimates have been made of 500,000 cacti collected per year from Texas alone (Lyons,

1976). Such large-scale collection in the southwestern U.S. continues to be reported (Harrington, 1980; Pew, 1978; Gorden, 1980; Banks, 1980;). The announcement of a newly discovered species is often followed by a virtual elimination of many of its populations to supply commercial demands. The type locality of Echinocereus kuenzleri, the Kuenzler hedgehog cactus, was completely collected shortly after its discovery and publication in the Cactus and Succulent Journal (U.S.) (Lyons, 1980). The extirpation of populations of newly described species has led some botanists to be deliberately vague in the description of new species localities in order to preserve the populations (see Heil, 1979; Castetter et al, 1976).

Table 28, taken from a recent report (McMahan, 1981a) shows that at least 21 rare U.S. cacti were reported as U.S. exports or imports from 1977-1979. It is unclear whether these represent field-collected or artificially propagated specimens. Reported trade in rare Mexican cacti is even more substantial as shown in Table 29. Forty-five species of rare Mexican cacti were reported as U.S. exports or imports from 1977 through 1979, sometimes in numbers exceeding 1,000 specimens. Table 30, prepared by authors McCarten and Gibson, lists certain rare U.S. and Mexican cacti and estimates historical abundance, effect of collecting on wild populations, and parts usually collected.

Several succulents have also been threatened by collecting, among them the "ghost man," Pachypodium namaquanum (illustrated in Figure 16), P. baroni windsori, and P. brevicale. Rauh (1972) reports that "On our last expedition to Madagascar in 1969 we found only a few plants (of P. baroni windsori) in the rocks below Windsor Castle. A collector must have destroyed nearly the whole locality." While official U.S. government sources record imports of only three P. brevicale in 1979, Gibson has learned of one U.S. dealer who imported two shipments of about 500 plants each during that year. A recent report in a South African newspaper tells of the arrest of the person in charge of gardens on the Hester Malan Nature Reserve near Springbok, South Africa, on the charge of selling nearly 1,500 protected succulent specimens, including the rare Pachypodium namequanum (Illegal Possession of Flora Alledged, The Argus, August 31, 1978).

A South African succulent listed on Appendix I, Aloe polyphylla, the spiral aloe, is estimated to have a total population of 2,500 to 3,500 at 36 sites. At least 11 of these sites no longer support this rare plant because they have all been collected (Beverly, 1980).

The Welwitschia family contains only one species, Welwitschia bainesii, a CITES Appendix I plant illustrated in Figure 17. One California landscape firm requested 3,000 plants from the Stellenbasch Botanic Garden in South Africa, but the request was denied (Tijmens, 1978).

Gibson has learned that, following rediscovery of Euphorbia turbiniformis, long thought to be extinct, over 450 plants were brought into the United States in one shipment. Similarly, collectors have reduced population levels of Euphorbia abdelkuri on Socotra Island to four individuals by their efforts to provide stock for commercial nurseries (The IUCN Plant Red Data Book,1979).

Collecting of cacti and succulents for use in furniture and for other ornamental uses has also had an effect on some populations. Such Argentinian

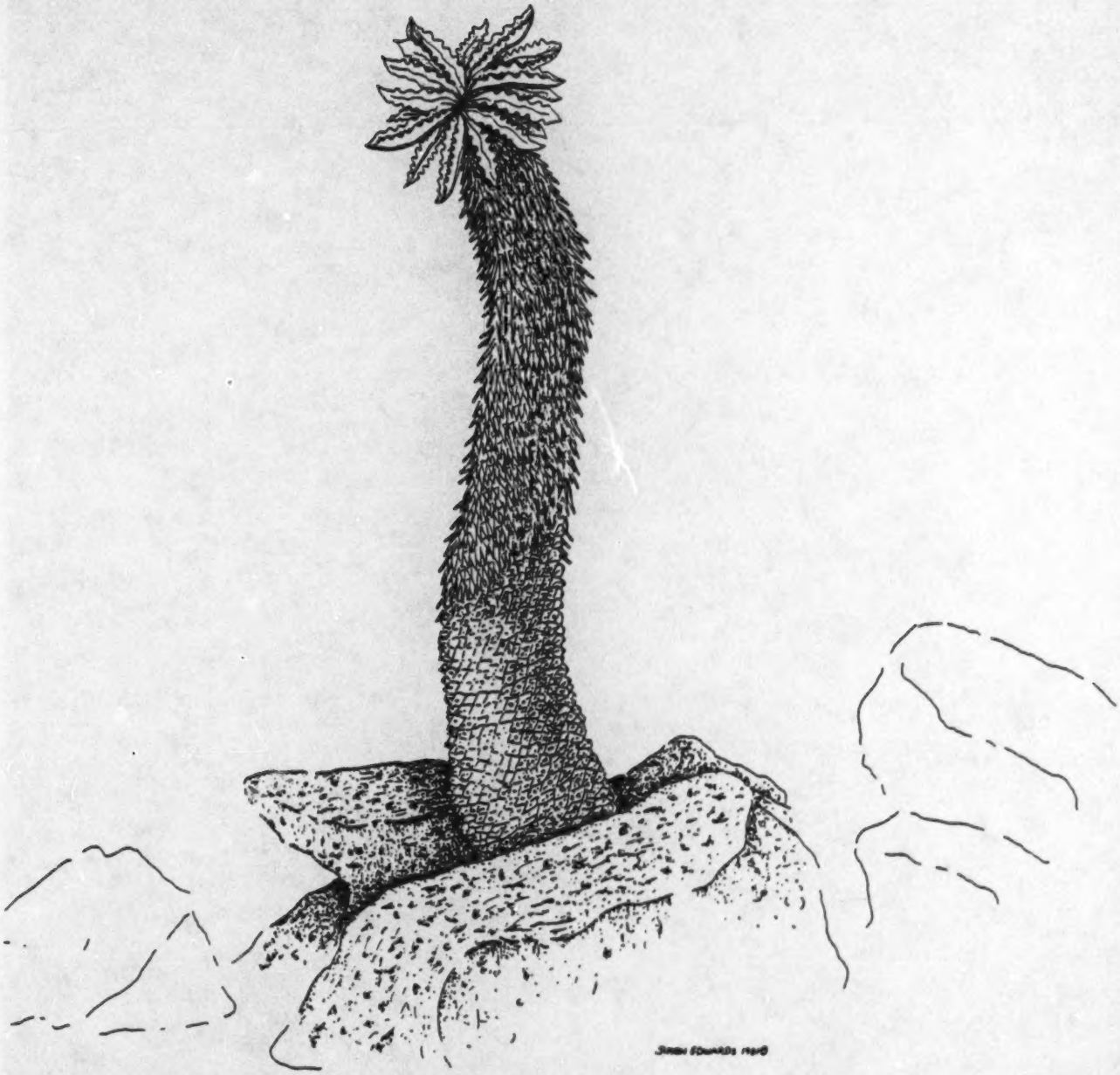


Figure 16. Pachypodium namaquanum, the "ghost man," recently added to CITES Appendix I, grows on southern and western steep slopes in a restricted region of Southwest Africa. Its rosette of leaves on the tip of the trunk invariably faces north at an angle. This species is popular among succulent fanciers, and small plants, one to 3 feet high, are reportedly regularly field collected.

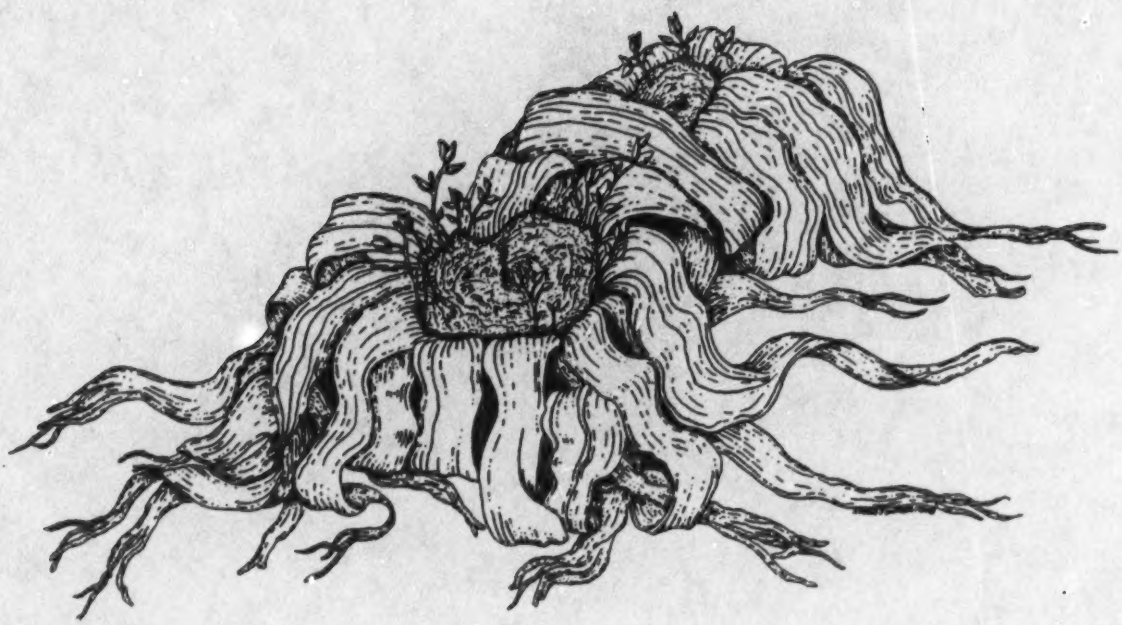


Figure 17. Welwitschia bainesii is a succulent species listed on CITES Appendix I. This bizarre, rare plant species resembles a giant green octopus sprawled on dry watercourses and desert flats in a small region within the Namib desert on Southwest Africa. At the juncture of its ribbon-like leaves and corky central disk, it produces bright red male or female cones. The plants obtain much of their water from nightly fog. Welwitschia's grown from seed are widespread in private collections and botanical gardens.

cacti as Trichocereus pasacana (the white torch cactus) and T. terscheckii are collected and dried for their wood, severely affecting wild populations of these species (de la Sota, 1977). The boojum tree, Idria columnaris, of Baja California, which has been collected to some extent for horticultural purposes, is also girdled and left to dry for its wood (J. Henrickson, pers. comm.). APHIS inspectors revealed to Gibson that over 2,400 boojums were imported into the U.S. in early 1981 by one company in Texas.

Orchids

Many orchid species are also reportedly threatened by zealous collectors. In Venezuela, Oncidium papilio (butterfly orchid), Masdevallia tovarensis, Cattleya gaskelliana (summer cattleya), C. mossieae (easter orchid), C. Iauddemanniana, C. lawrenceana (lawrence cattleya), C. jenmanii, C. percivaliana (christmas cattleya), and Phragmipedium caudatum (mandarin orchid), are said to be rare and popular among local orchid societies (Steyermark, 1977). Tour groups sometimes offer orchid collecting as a part of the tour schedule while visiting Caribbean islands, and some heavily visited areas are nearly devoid of roadside orchids (Howard, 1977). Table 31 provides a sample of rare orchid species in trade.

Some relatively widespread species are reported to have been extirpated from a proportion of their range. For example, an expedition to Mindanao Island to collect Vanda sanderiana, "queen of Philippine orchids," found no specimens despite a "thorough" search. The orchid's rarity was attributed to mass collecting, followed by logging of the host dipterocarp trees (Santos, 1974).

Several orchid species with restricted natural ranges have become critically rare through commercial collecting. For example, one of Brazil's orchid conservationsts, Anton de Ghillany, describes the recent fate of CITES Appendix I Laelia jongheana, illustrated in Figure 1. He reports that this species had been entirely eliminated from the Serrade Caraca, Minais Gerais, by "indescriminate collecting," and was considered extinct. In 1973, de Ghillany discovered "great quantities" of the plant growing on trees above the gulches of the Serra de Gaviao; these plants later disappeared after a visit to the area by one of Brazil's commercial collectors. In 1975, de Ghillany once again discovered an isolated population, but it too soon was devoid of plants, presumably pilfered by collectors (de Ghillany, 1978). Such intense pressure of wild populations in unnecessary because plants of Laelia johnheana may be raised from seed (Ayensu and DeFilipps, 1978). Similar collecting pressures have been exerted on Paphiopedilum druryi, a rare ladyslipper from India (The IUCN Plant Red Data Book, 1978).

Orchids native to the U.S. also appear to be field collected in some instances. Cyrtopodium punctatum, the cowhorn orchid, has been all but eliminated from the cypress swamps of southern Florida, including a National Wildlife Refuge (McCollum, 1977). Entire populations of Cypripedium acaule, a ladyslipper orchid, have been removed in a brief period by large-scale commercial collecting (Henry, 1977). Both Cypripedium californicum, the California lady slipper, and Encyclia boothiana var. erythronioides, the dollar orchid, may be threatened by commercial and private collectors (Ayensu and DeFilipps, 1978); both species are undergoing further study by

the U.S. Fish and Wildlife Service for possible listing under the U.S. Endangered Species Act (Fed. Reg. notice, December 15, 1980).

Insectivorous Plants

In the United States, as many as 45 plant dealers may sell insectivorous plants, often via mail orders. In 1975, one New Jersey dealer claimed to be selling 10,000 insectivorous plants each month (Selkow, 1975). Among the insectivorous plants believed to be depleted by trade is Sarracenia oreophila, the green pitcherplant with an estimated wild population of no more than 1,300 individuals. This species is listed as "endangered" under the U.S. Endangered Species Act, and has recently been added to CITES Appendix I. Gibson reports that there are specimens in collections in the U.K., Japan, Germany, Australia, and South Africa. For another pitcherplant, Folkerts (1977) reported that "many of the previously known populations (of Sarracenia jonesii, the mountain sweet pitcherplant) have been damaged by overcollecting on the part of commercial dealers, amateur enthusiasts and even professional botanists." According to Gibson, two sites for this species, stable for 20 years, were completely extirpated within a few years of their having been revealed to an amateur enthusiast. In 1975, one hobbyist advertised in an Alabama (U.S.A.) county newspaper offering $20 for help in locating a site for the rare Sarracenia alabamensis subsp. alabamensis, the Alabama canebrake pitcherplant, a species estimated as having 500 individual plants remaining in wild populations (The IUCN Plant Red Data Book, 1978). He offered an additional fee for mailing specimens directly to him (Chilton County, Alabama News, June 19, 1975, p. 9).

The giant pitcherplant, Nepenthes rajah, from Sabah (illustrated in Figure 18), has a wild population that Gibson estimates as several thousand individuals. Its insect trap, one of the largest of any Asian plant, makes this insectivorous plants highly popular among collectors. Although its four known populations occur in a national park, Gibson has learned of several instances when plants have been collected. A related species, Nepenthes khasiana is collected for biological supply houses. This and other factors have severely reduced wild populations, reportedcly causing India to ban its export (Hornbill and Baishya, 1977).

Dionaea muscipula, the Venus flytrap, endemic to an area of coastal plain about 320 km long in North and South Carolina in the United States (The IUCN Plant Red Data Book, 1978), is extensively field-collected for the plant trade. Botanists in North Carolina have recently verified 50 populations of this plant species, 32 in the last year. Although most of the plants do come from wild populations, the plant reproduces rapidly in the wild, and present levels of harvest may not threaten the plant with extinction (Sutter, pers. comm.). Continuing monitoring of Dionaea harvest and trade is important to determine the effect that trade will have on future wild populations.

Cycads

Field-collection of cycads may also be occurring. For example, one catalogue offering seeds of Encephalartos latifrons (a bread palm, a species nearly extinct in the wild according to the Threatened Plants Committee Botanic

Garden Conservation Coordinating Body) advertised that the seeds were collected "from the wild," even though collecting seeds is illegal in South Africa. South Africa, a major plant exporting country, reports all plant exports as "artificially propagated." Information available to the authors casts doubt on these claims. Gibson has learned from a South African

botanist, on the basis of an examination of the sizes of specimens offered in one nursery's catalogue, that the specimens offerred for sale are likely to be field-collected. The plants apparently slipped by the authorities labelled as "seedlings" but were large enough for the expert to estimate their age as eight to ten years. Among plants fitting this description are specimens of Encephalartos ferox, E. natalensis, E. villosus, E. lemannii, E. princeps, E. horridus, and E. manikensis, all known commonly as "bread palms." The nursery also offered a new species or variety, E. eugene-maraisii dolomitica, about which the expert said, "These certainly are not seedlings as no cones have yet been found for the Bot.(anical) Research inst.(itute) to describe."

Effects of Collecting and Habitat Destruction

Many plant species are threatened by both habitat destruction and collecting. The combined effects can prove particularly damaging. Arp (1978) points out that as orchid habitat shrinks, more and more collectors converge on the remaining sites; their cumulative efforts threaten the orchid species having local distributions. Whitelock (1978) expresses concern that the collecting pressure, when added to conversion of habitat, could cause considerable damage to Central American cycad populations which are usually found in small, isolated stations of a single species. In the U.S., all twenty-one species of cacti listed as endangered or threatened under the U.S. Endangered Species Act, are represented by only a few populations that contain between 1,000 and 10,000 individuals, and are threatened by both collecting and by habitat destruction. Other examples include Agave arizonica which has several small populations totalling fewer than fifty plants (Gentry, 1970). The recently described Sclerocactus whipplei var. heilii from New Mexico numbers but a few hundred plants (Castetter et. al., 1976), making it particularly vulnerable from commercial or private field-collecting.

Other horticulturally desirable species are found primarily in areas fully protected from habitat disturbance, such as national parks or reserves. Despite habitat protection, these plant species often continue to be threatened by commercial collecting. Poaching has occurred in U.S. and foreign national parks and monuments, as well as in privately-owned reserves. One of the few specimens of the bread palm, Encephalartos woodii, was reportedly stolen from a botanical garden in Durban, South Africa (Bond,1978). In the United States, cactus "rustling," has been reported in Big Bend National Park and Organ Pipe and Joshua Tree National Monuments by the U.S. National Park Service. Table 32 lists a few of the plant species found in areas designated as reserves or national parks but which nevertheless are currently threatened by commercial collecting.

Introduction of Exotic Weeds and Plant Diseases

The United States, like many countries, inspects imported plants for diseases and insects. This inspection is the main job of the APHIS inspectors at the U.S. ports of entry. These same inspectors also check for verification of CITES plants.

To help slow the spread of "such weeds which interfere with the growth of useful plants, clog waterways and interfere with navigation, cause disease, or have other adverse effects upon man or his environment," the U.S. Congress passed the Federal Noxious Weed Act in 1974. The Act prohibits, among other things, "knowing" movement of a "noxious weed" into the United States.

Aside from the obvious agricultural benefits of such prohibitions, inspections for exotic weeds and plant diseases also may benefit rare plant species; slowing the introduction of these exotic organisms reduces competition with native rare plants, especially in island ecosystems. Examples include threats to native plant species of Guam (Stone, 1977), and Hawaii (Fosberg, 1975). As early as 1939, biologists were pointing out that introduced plant species provided major threats to estuaries, alpine habitats, and similar environments (Fernald, 1939). Crosby (1972) reports that 18% of North American flora is exotic.

C. Enforcement Problems

In May 1977, when the U.S. Management Authority's regulations governing import and export of CITES-protected species came into effect, APHIS chose to advise plant importers who lacked CITES permits to contact the Management Authority, but not to detain or refuse entry to any shipment because of lack of or inaccuracy of documentation (Memorandum from James O. Lee, Jr., Deputy Administrator, APHIS, to Regional Directors, May 31, 1977). The result of this APHIS policy was virtually unregulated trade in plants protected by CITES. Reportedly, only 0.4% of cactus and succulent imports for the period of October 1977 to July 1978 had CITES documentation (Campbell and Tarr, 1980). In mid-July 1978, APHIS reversed this policy and began detaining import shipments lacking proper CITES documents, causing at least one outraged report from plant importers (see, for example, Peterson, 1978).

As of late 1981, such confusing occurrences are rare; however, other problems still occur. For example, U.S. plant exports remain largely unregulated because AHPIS inspectors allow export shipments to take place upon certification that the plants are free from pests. Exporters are reminded that CITES documents may be required, but plants are not detained if these documents do not accompany the shipment. Once the exporter has his "plant health certificate," he or she may simply mail the package, and rely on poor enforcement in the importing country to let the plants through.

APHIS port inspectors' main priority is the inspection for plant pests and diseases. Most are trained in insect identification and not in plant identification, except for some instruction on how to recognize exotic weeds. APHIS also allows exemptions for personal effects, and thus nearly always clears people carrying fewer than thirteen specimens, if the specimens come from non-CITES countries.

A major problem plaguing U.S. CITES efforts is poor compliance with the data requirements of CITES. An analysis by the U.S. Fish and Wildlife Service of documents accompanying plant imports in 1979, showed that only 17.3% recorded the CITES designations and type of specimen, and only 12.1% the Appendix on which the species is listed (TRAFFIC (U.S.A.) Newsletter, Summer, 1980). While 73.5% were said to give the scientific name of the specimen, our own review of CITES records indicates that this designation was often only the family, that is Cactaceae or Orchidaceae. Further, while 82.7% of the documents indicated the quantity of the specimens, our own review once again shows that often this was given in a form of little use for assessing volumes in trade, such as "number of seeds," or number of boxes or shipments. In order to assess any effect on wild populations, reports of exports and imports must be determined for the volumes of individual species.

A further problem surfaces when examining the CITES Annual Reports from Party Countries (Tables 24-27). Most Parties have not submitted annual reports, so data from these countries are largely unavailable. Some Parties submitting reports do not report trade in plants. Finally, Parties, including the United States, that do report plant trade, often report only down to the family or genus level. This occurs even in cases when species-specific data are available. Again, in order for trade controls and monitoring to be effective, plant data must be provided by species.

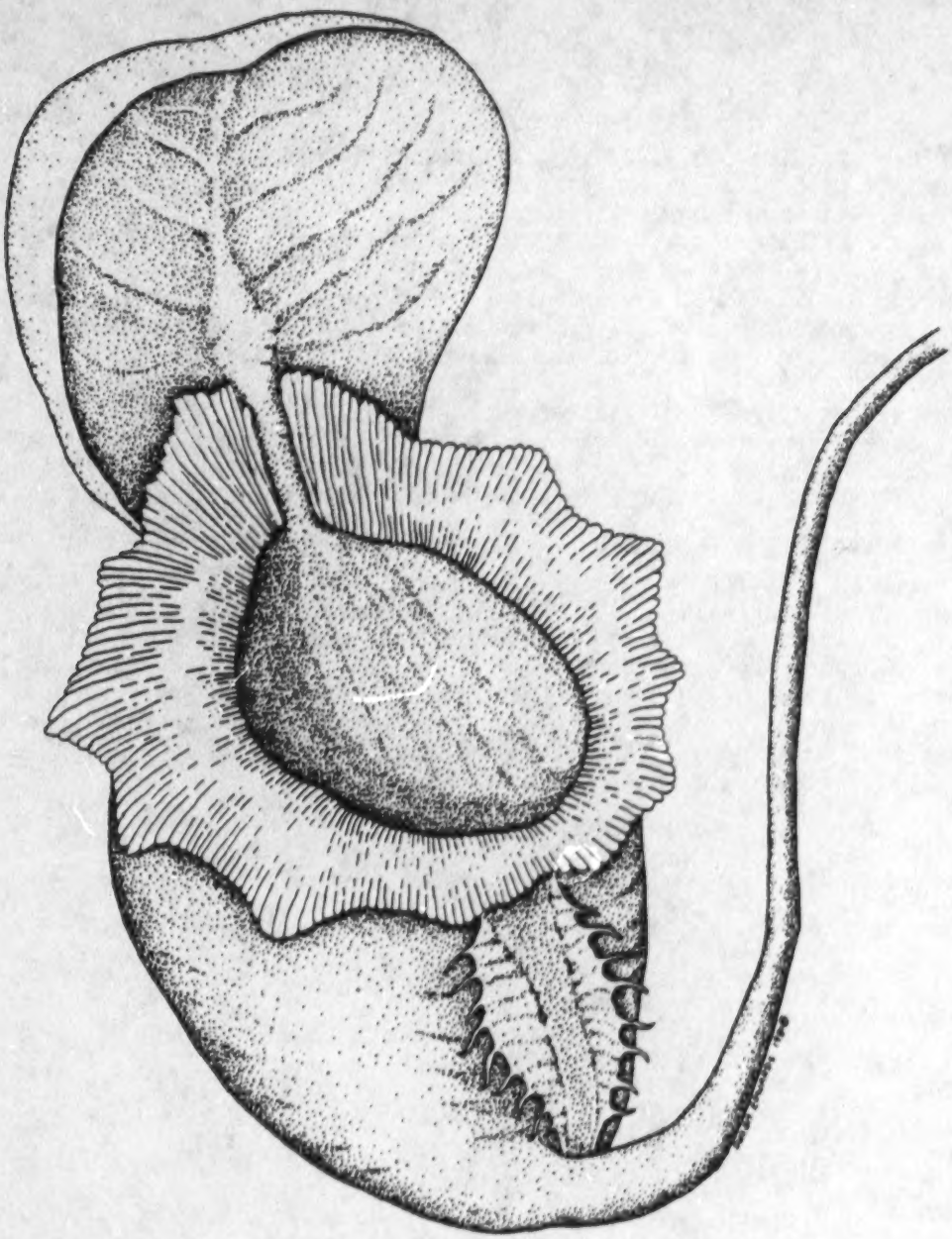


Figure 18. Nepenthes rajah, the giant pitcherplant, recently added to CITES Appendix I, grows only in montane rainforests on the misty slopes of Mt. Kanabalu, Sabah, Malaysia. Plant enthusiasts collect this rare pitcherplant for its large, frilly, crimson insect traps. While currenly rare in cultivation, illegal field-collected plants have allegedly been smuggled out of Kinabalu National Park by commercial nurseries in Australia, France, and the U.S.A.

Table 28
Exports and Imports of Cactus Species listed or under Review for Listing under the U.S. Endangered Species Act.

Scientific and Common Name	1977 Commercial Exports	1978 Commercial Exports	1979 Commercial Exports	1979 Commercial Imports	Totals
Endangered Plant Species					
Ancistrocactus tobuschii (bendera county c.)	--	--	4	--	4
Pediocactus bradyi (marble canyon cactus)	2	2	58	--	62
Pediocactus knowltonii (knowlton hedgehog c.)	3	--	--	--	3
Pediocactus sileri (gypsum cactus)	2	--	--	--	2
Sclerocactus wrightiae (wright fishhook c.)	1	--	--	--	1
	8	2	62	0	72
Threatened Plant Species					
Coryphantha sneedii v. Teei (lee pincushion c.)	--	6	--	--	6
Neolloyida mariposensis (mariposa cactus)	1	-	25	--	26
Sclerocactus glaucus	3	--	--	--	3
Sclerocactus mesae-verdae (mesae-verdae c.)	4	--	--	--	4
	8	6	25	0	39
Plant Species Under Review					
Cereus greggii (queen of the night)	--	--	3	--	3
Cereus portoricensis (higo chumbo)	--	--	11	--	11
Epithelantha bokei	--	2	3	--	5
Ferocactus eastwoodiae (yellow-spined barrel)	--	--	1	--	1
Mammillaria thornberi	5	--	3	--	8
Neolloydia warnockii	1	--	--	--	1
Pediocactus papyracanthus (paper spine pee wee)	--	--	4	--	4
Pediocactus paradinei (houserock cactus)	2	--	--	--	2
Pediocactus peeblesianus v. fickeiseniae	3	--	--	--	3
Rhipsalis baccifera (mistletoe cactus)	--	--	2	8	10
Sclerocactus polyancistrus (pineapple cactus)	4	--	--	--	4
	15	8	28	8	59
TOTAL-ALL PLANTS IN THIS TABLE	31	16	115	8	170

Source: U.S. CITES data as analyzed in McMahan, 1981.

Table 29
Reported Trade in Rare Mexican Cacti.

Scientific and Common Name	1979 Imports	1979 Exports	Total	Comments
Ariocarpus agavoides[1,2] (living rock cactus)	1,389	1,300	2,689	imports of 291 plants and exports of 53 plants in 1979 identified only as Ariocarpus.
Ariocarpus fissuratus[1,2] (Mexican living rock)	0	795	795	
Ariocarpus fissuratus var. lloydii[1,2]	2,012	945	2,957	
Ariocarpus kotschoubeyanus[1,2] (kotchoubey living rock cactus)	2,229	4,440	6,669	
Ariocarpus scapharostrus[1,2] (living rock cactus)	4	0	4	
Ariocarpus trigonus[1,2] (living rock cactus)	996	0	996	
Astrophytum capricorne[1] (goat's horn cactus)	593	1,300	1,893	imports of 106 plants and exports of 1 shipment identified only as Astrophytum.
Astrophytum myriostigma[1] (bishop's cap)	516	1,026	1,542	
Astrophytum ornatum[1] (monk's hood)	2	0	2	
Aztekium ritteri[1] (aztec cactus)	62	420	482	
Backegergia militaris[1]	2	0	2	
Cereus (Peniocereus) greggii var. greggii[1] (night blooming cereus)	0	0	0	3 plants exported in 1979 as Peniocereus greggii.
Cereus pensilis[1,2]	0	0	0	
Cochemiea halii[2]	1	0	1	
Cochemiea maritima[1,2]	0	0	0	1 plant exported in 1977.
Cochemiea pondii[1,2]	0	0	0	1 plant exported in 1977.
Cochemiea setispina[1,2]	0	0	0	
Coryphantha werdermannii[1]	0	0	0	imports of 105 plants and exports of 3 shipments in 1979 identified only as Coryphantha.

[1] Preliminary Draft List of Rare Cacti of Mexico, coutesy of Joseph Dowhan, Botanist, Office of the Scientific Authority, U.S. Fish and Wildlife Service, Department of the Interior.

[2] Preliminary list of rare cacti prepared by the Department of Ecology, Mexican National Forestry Research Institute, and transmitted in a letter dated November 25, 1980 to Harvey Ford, Deputy Administrator, Plant Protection and Quarantine, Animal and Plant Health Inspection Service, U.S. Department of Agriculture.

Table 29, continued.

Scientific and Common Name	1979 Imports	1979 Exports	Total	Comments
Echinocactus asterias[1,2] (sea urchin cactus)	335	0	335	
Echinocactus grusonii[1,2] (golden barrel)	160	0	160	
Echinocereus lindsayi[1,2] (lindsay's cactus)	0	0	0	
Echinofossulocactus albatus[1]	25	65	85	plants identified as Stenocactus albatus
Echinofossulocactus boedekerianus[1,2]	0	0	0	
Echinofossulocactus sulfureus[1,2]	0	0	0	
Echinofossulocactus tetraxiphus[1,2]	0	0	0	
Echinofossulocactus vaupelianus[1,2]	0	0	0	
Epiphyllum chrysocardium[1]	2	0	0	7 plants imported in 1979 identified only as Epiphyllum
Epithelantha bokei[1,3] (button cactus)	3	0	32	plants exported in 1978; imports of 30 plants in 1979, exports of 50 plants in 1979, and exports of 30 plants in 1978 identified only as Epithelantha
Epithelantha micromeris var. denispina[1,3]	0	0	0	
Epithelantha micromeris var. greggii[1,3]	205	0	205	
Epithelantha micromeris var. micromeris[1,3]	700	950	1,650	identified only as Epithelantha micromeris
Epithelantha micromeris var. rufispina[1,3]	0	0	0	
Epithelantha micromeris var. unguispina[1,3]	0	0	0	
Epithelantha pachyrhiza[1,3] (button cactus)	0	0	0	
Epithelantha polycephala[1,3] (button cactus)	0	0	0	
Ferocactus crassihamatus[1,2] (barrel cactus)	0	0	0	
Ferocactus diguetii[1] (barrel cactus)	0	0	0	
Ferocactus peninsulae var. viscainensis[1,2]	0	0	0	
Ferocactus rectispinus[1] (barrel cactus)	0	0	0	
Ferocactus townsendianus var. santa-maria[1]	0	0	0	
Ferocactus townsendianus v. townsendianus[1,2]	0	0	0	

3According to the letter cited in footnote 2, the entire genus in Mexico is considered rare.

Table 29, continued.

Scientific and Common Name	Imports	Exports	Total	Comments
Lemaireocereus eruca[1,2] (creeping devil)	1	0	1	1 plant exported in 1978; export of 115 plants in 1979, imports of 3 plants in 1979, and exports of 1 plant in 1978 identified only as Machaerocereus, Ritterocereus, or Lemaireocereus
Leuchtenbergia principis[1,2] (prism cactus)	130	0	130	exports of 100 plants in 1978 an 2 plants in 1979 identified only as Leuchtenbergia
Lobeira mackdougallii[1,2]	0	0	0	
Lophocereus(Cereus) schottii[2] (totem pole)	0	0	0	
Lophocereus schottii var. mieckleyanus[1,2]	0	0	0	
Lophocereus schottii forma monstrosus[1,2] (monstrose totem pole)	4	0	4	
Lophophora diffusa[1]	0	0	0	
Mammillaria aureiceps[1,2]	0	0	0	
Mammillaria coahuilensis[1,2]	102	0	102	4 plants exported in 1977
Mammillaria crucigera[1,2]	0	0	0	
Mammillaria erectacantha[1,2]	0	0	0	
Mammillaria hahniana[1,2] (old lady cactus)	0	0	0	2 plants exported in 1978
Mammillaria herrerae[1,2] (herrera mammillaria)	1,120	600	1,720	
Mammillaria humboldtii[1,2]	113	0	113	
Mammillaria hutchisoniana[1,2]	0	0	0	
Mammillaria lenta[1,2]	320	300	620	
Mammillaria magallanii[1,2]	0	0	0	
Mammillaria microhelia[1,2]	0	0	0	
Mammillaria microthele[2]	0	0	0	
Mammillaria napina[1,2]	0	1S	1S	numbers not identified
Mammillaria pennispinosa[1,2]	2	0	2	1 plant exported in 1978
Mammillaria plumosa[1,2] (feather cactus)	3	0	3	
Mammillaria schiedeana[1,2] (feather top cactus)	0	0	0	12 plants exported in 1978
Mammillaria solisioides[1,2]	0	0	0	
Marenopuntia marenae[1,2]	2	0	2	reported as Melocactus delessertianus
Mitrocereus fulviceps[1]	0	0	0	

[illegible]-shipment

Table 29, continued.

Scientific and Common Name	1979 Imports	1979 Exports	Total	Comments
Neoevansia zopilotensis[1]	0	0	0	
Neolloydia odorata[1]	0	0	0	
Neolloydia pulluneana[1]	0	0	0	
Obregonia denegrii[1,2] (artichoke cactus)	572	0	572	
Opuntia chaffeyi[1] (pricklypear cactus)	0	0	0	
Opuntia hamiltonii[1,2] (pricklypear cactus)	0	0	0	
Opuntia santamaria[1,2] (pricklypear cactus)	0	0	0	
Pelecyphora aselliformis[1] (hatchet cactus)	964	624	1,588	exports of 140 plants in 1979 and exports of 77 plants in 1977 identified only as Pelecyphora
Pelecyphora strobiliformis[1] (pinecone cactus)	0	1,200	1,200	104 exported in 1977; imports identified as Encephalocarpus strobiliformis
Peniocereus fosterianus[1]	0	0	0	
Peniocereus transmontanus[1]	3	0	3	
Peniocereus johnstonii[1]	0	0	0	
Peniocereus macdougallii[1]	0	0	0	
Peniocereus mareanus[1]	0	0	0	
Peniiocereus tepalcatepecanus[1]	0	0	0	
Pterocereus foetidus[1]	0	0	0	
Solisia pectinata[1,2]	0	0	0	
Strombocactus disciformis[1]	553	1,110	1,663	exports of 5 plants and 5 shipments of plants in 1979 identified only as Strombocactus or Turbinicarpus
Thelocactus schwarzii[1]	0	0	0	
Thelocactus subterraneus[1]	0	0	0	
Thelocactus ysabelae[1]	0	0	0	
Turbinicarpus flaviflorus[1,3]	110	0	110	
Turbinicarpus laui[1,3]	4	0	4	
Turbinicarpus lophophoroides[1,3]	120	380	500	6 plants imported in 1978
Turbinicarpus(Strombocactus) pseudomacrochele var. krainzianus[1,3]	0	0	0	

Table 29, continued.

Scientific and Common Name	1979 Imports	1979 Exports	Total	Comments
Turbinicarpus (Strombocactus) pseudomacrochele var. pseudomacrochele[1,3]	249	500	749	3 plants exported in 1978; exports reported as Turbinicarpus pseudomacrochele
Turbinicarpus pseudopectinatus[1,3]	1,330	5,335	6,685	reported as Turbinicarpus pseudopectinatus, Pelecyphora pseudopectinatus, or Normanbokea pseudopectinatus
Turbinicarpus (Strombocactus) schiedickeanus var. flaviflorus[1,3]	0	0	0	
Turbinicarpus (Strombocactus) schiedickeanus var. gracilis[1,3]	0	0	0	
Turbinicarpus (Strombocactus) schiedickeanus var. klinkeranus[1,3]	1	0	1	4 plants exported in 1978; reported as Turbinicarpus klineranus
Turbinicarpus (Strombocactus) schiedickeanus var. machrochele[1,3]	1	0	1	reported as Turbinicarpus machrochele
Turbinicarpus (Strombocactus) schiedickeanus var. schiedickeanus[1,2]	657	0	657	reported as Turbinicarpus schiedickeanus
Turbinicarpus (Strombocactus) schiedickeanus var. schwarzii[1,3]	2	0	2	4 plants exported in 1978
Turbinicarpus valdezianus[1,3]	1	0	1	1 plant exported in 1977 reported as Normanbokei valdezianus
Wilcoxia albiflora[1]	0	0	0	
Wilcoxia schmollii[1,2] (lamb's tail cactus)	0	100	100	
Wilcoxia tomentosa[1,2]	0	0	0	

Source: U.S. CITES data as analyzed in McMahan, 1981.

Table 30
Characteristics of Rare Cacti in Trade.

Scientific Name	Native Region	Status*	Major Sources of Plants in Commerce	Plant Parts† Field Collected	Historical Distribution	Effect of Trade on Rarity	Number Reported in Trade 1977-1979
Ancistrocactus tobuschii	S.W.USA	E	field	IP	rare	moderate	4
Coryphantha minima	S.W.USA	E	field & prop.	IP	--	heavy	0
Coryphantha ramillosa	S.W.USA	T	field	IP	rare	moderate	0
Coryphantha sneedii v. leei	S.W.USA	T	field & prop.	IP & C	--	heavy	6
Coryphanth sneedii v. sneedii	S.W.USA	E	propagated	--	rare	moderate	0
Echinocactus horizonthalonius v. nicholii	S.W.USA	E	field	IP	common	heavy	0
Echinocereus engelmanii v. purpureus	S.W.USA	E	field	IP & C	rare	light	0
Echinocereus kuenzleri	S.W.USA	E	field & prop.	IP & C	rare	moderate	0
Echinocereus lloydii	S.W.USA	E	field & prop.	IP	rare	light	0
Echinocereus reichenbachii v. alberti	S.W.USA	E	field & prop.	IP	rare	moderate	0
Echinocereud triglochidiatus v. arizonicus	S.W.USA	E	field & prop.	IP	rare	light	0
Echinocereus triglochidiatus v. inermis	S.W.USA	E	field	IP	rare	moderate	0
Echinocereus viridiflorus v. davisii	S.W.USA	E	field & prop.	IP & Sd	rare	heavy	0
Neolloydia mariposensis	S.W.USA	T	field	IP	rare	moderate	25
Pediocactus bradyi	S.W.USA	E	field	IP	rare	heavy	62
Pediocactus knowltonii	S.W.USA	E	field	IP	rare	heavy	3
Pediocactus peeblesianus v. peeblesianus	S.W.USA	E	field	IP	rare	heavy	0
Pediocactus sileri	S.W.USA	E	field	IP	rare	heavy	2
Sclerocactus glaucus	S.W.USA	T	field	IP	rare	heavy	3
Sclerocactus mesae-verdae	S.W.USA	T	field	IP	rare	moderate	4
Sclerocactus wrightiae	S.W.USA	E	field	IP	rare	light	1
Ariocarpus agavoides	Mexico	C,M	field	IP	rare	heavy	2,689
Ariocarpus kotschoubeyanus	Mexico	M	field	IP	rare	heavy	6,669
Ariocarpus scapharostrus	Mexico	C,M	field	IP	rare	heavy	4
Aztekium ritteri	Mexico	C	field	IP	rare	heavy	482

*E = endangered, T = threatened, P = under Review (all for U.S. Endangered Species Act); C = CITES Appendix I; M = a Mexican rare cactus (see Table 27)
†IP = individual plant; C = cutting; Sd = Seeds.

Table 30, continued.

Scientific Name	Native Region	Status*	Major Sources of Plants in Commerce	Plant Parts Field Collected	Historical Distribution	Effect of Trade on Rarity	Number Reported in Trade 1977-1979
Coryphantha hesteri	S.W.USA	P	field	IP	rare	moderate	0
Coryphantha recurvata	S.W.USA	P	propagated	IP	--	light	0
Coryphantha scheeri v. uncinata	S.W.USA	P	--	IP	rare	light	0
Coryphantha sulcata v. nickelsiae	S.W.USA	P	field	IP	rare	light	0
Coryphantha strobiliformis v. durispina	S.W.USA	P	field	IP	rare	moderate	0
Coryphantha vivipara v. alversonii	S.W.USA	P	field	IP	--	light	0
Echinocactus asterias	Mexico	M	field & prop.	IP	common	heavy	335
Echinocereus chloranthus v. neocapillus	S.W.USA	P	field & prop.	IP,Sd & C	--	moderate	0
Echinocereus engelmanii v. howei	USA	P	field	IP	rare	light	0
Echinocereus grusonii	Mexico	M	propagated	IP & Sd	rare	moderate	160
Echinocereus lindsayi	Mexico	C,M	field	IP	rare	heavy	0
Echinocereus reichenbachii v. fitchii	S.W.USA	P	prop.	IP & C	rare	moderate	0
Echinocereus russanthus	S.W.USA	P	field	IP	rare	moderate	0
Epithelantha bokei	S.W.USA	P	field	IP	rare	heavy	5
Ferocactus viridescens	USA	P	field	IP	rare	light	1
Leuchtenbergia principis	Mexico	M	field & prop.	IP & Sd	--	heavy	230
Mammillaria orestera	S.W.USA	P	field & prop.	IP & Sd	rare	light	0
Mammillaria thornberi	S.W.USA	P	propagated	IP & C	rare	light	8
Neolloydia erectocentra v. erectocentra	S.W.USA	P	field	IP	--	heavy	0
Neolloydia gautii	S.W.USA	P	--	IP	rare	light	0
Obregonia denegrii	Mexico	C,M	field	IP	rare	heavy	572
Pediocactus papyracanthus	S.W.USA	P	field	IP	--	moderate	10
Pediocactus paradinei	S.W.USA	P	field	IP	rare	moderate	2
Sclerocactus polyancistrus	USA	P	field	IP	--	moderate	4
Thelocactus bicolor v. flavidispinus	S.W.USA	P	field	IP	--	moderate	0
Turbinicarpus pseudo-pectinatus v. rubriflorus	Mex.	M,R	field	IP	rare	heavy	0
Turbinicarpus valdezianus	Mexico	M	field	IP	common	heavy	2

Source: assessments made by Niall McCarten. CITES trade data are from McMahon, 1981a.

Table 31
Rare Orchids in Trade

Scientific Name	Common Name	Status*	Number of Nurseries Selling This Species	Retail Price Range (1979)	U.S. Imports (1979)
Diplomeris hirsuta	snow orchid	RDB	1	$25	56
Laelia jongheana	amalias	APP. I	4	$35-$50	3
Laelia milleri	amalias	Withner,1976	6	$7.50-$12.00	67
Paphiopedilum druryi	ladyslipper	RDB	2	$50-$100	0
Paphiopedilum bellatulum	ladyslipper	TAG	2	$500	61
Paphiopedilum niveum	ladyslipper	TAG	16	$0.90-$20.00	2
Phalaenopsis gigantea	moth orchid	TAG	1	$150	0
Phalaenopsis violacea	moth orchid	TAG	5	$5-$20	19
Renanthera imschoestiana		APP. I	7	$5.95-$20	97
Sobralia xantholeuca		RDB	2	$7.00-$7.50	0
Vanda coerulea	blue vanda	APP. I	11	$1.50-$35.00	90
Vanda sanderiana	vanda	Santos,1974	2	$15.00-$99.50	2

*RDB = listed as rare in the IUCN Plant Red Data Book, 1978; APP. I = listed on CITES Appendix I.
TAG = assessment of Thomas A. Gibson.

Sources: Numbers of nurseries and prices based on a survey of orchid catalogues issued by 75 nurseries. The study was carried out by Susan (Gail) Munro for Traffic (USA). Import data is from U.S. CITES records of the U.S. Fish & Wildlife Service and was provided courtesy of the International Convention Advisory Commission.

Table 32
Rare Plant Species Reportedly Collected from Protected Areas

Scientific Name	Common Name	Preserve	Source of Information
Cactaceae			
Coryphantha ramillosa	bunched cory cactus	Big Bend Nat'l Park, USA	U.S. Fish & Wildlife Service
Epithelantha bokei		Big Bend Nat'l Park, USA	Ayensu & DeFilipps, 1978
Pediocactus sileri	siler pincushion cactus	Zion Nat'l Park, USA	U.S. Fish & Wildlife Service
Droseraceae			
Dionaea muscipula	Venus flytrap	Private Reserve, USA	Gibson, personal observation
Nepenthaceae			
Nepenthes rajah	giant pitcher plant	Kinabalu Nat'l Park, Malaysia	Gibson, personal observation
Nepenthes burbidgesi		Kinabalu Nat'l Park, Malaysia	Gibson, personal observation
Nepenthes edwardsiana		Kinabalu Nat'l Park, Malaysia	Gibson, personal observation
Nepenthes vietchii		Mt. Mulu Nat'l Park, Malaysia	Gibson, personal observation
Nepenthes muluensis		Mt. Mulu Nat'l Park, Malaysia	Gibson, personal observation
Portulucaceae			
Lewisia tweedyi		Tumwater Reserve, WA, USA	Hohn, in litt.
Sarraceniaceae			
Sarracenia oreophila	green pitcherplant	DeSoto State Pk, AL, USA	Ayensu & DeFilipps, 1978
Sarracenia jonesii	mountain sweet pitcherplant	Private Reserve, USA	Gibson, personal observation
Heliamphora heterodoxa		Cainaina Nat'l Pk, Venezuela	J. Bogner, Carnivorous Plant Newsletter, 1977
Welwitschiaceae			
Welwitschia bainesii	welwitschia	Namib Desert Pk, Namibia	Gibson, personal observation

Chapter V.

A View from Inside the Plant Trade

This chapter is based almost entirely on the personal observations of authors McCarten and Gibson, who have had extensive experience in various aspects of the plant trade. Appendix C describes some of the other experience of these and the authors.

Nurseries trading entirely in artificially propagated plants follow simple and straightforward procedures. They propagate their stock on their premises or purchase it from other propagators. They then sell plants either over-the-counter or through the mail. These nurseries generally have little difficulty in meeting the requirements of Customs and USDA inspections required for international trade. On the other hand, nurseries including collected specimens in their stock must overcome the economic and practical difficulties of collecting from distant and inaccessible locations. Even nurseries trading entirely in propagated plants often recruit new species by an initial field collection. New species are sometimes introduced to cultivation by academic botanists associated with amateur plant societies. In a few instances, a botanist may offset the cost of his or her expedition by selling the plants as "propagative" material to a friend in the commercial trade.

A. The Plant Collecting Process

The process of collecting, transporting, and preparing a specimen for sale is essentially the same regardless of whether the plant is an orchid, cactus, cycad, or other plant. For cacti or succulents, the number of specimens of a single species collected range from 200 to 300 to as many as 50,000; for orchids, only 20 to 30 specimens per species are commonly taken. Generally no fewer than 20 species are collected on one trip.

Once a wild population has been located, collectors may solicit the help of local people to collect specimens for a token payment per plant. Hoping to get more money, the helpers often collect other species, and an entire hillside, field, or tree may be stripped of possibly valuable plants. The specimens are then tightly packed in boxes, with damaged plants or specimens of unwanted species abandoned by the roadside. One result of this practice is that even the most accurate trade data do not reveal the actual number removed from wild populations.

The crated plants are transported by truck to the U.S. border if coming from Mexico, or to an airport or shipyard if coming from Africa or South America. If the collector is stopped by local officials and lacks collecting permits, he may be threatened with imprisonment, confiscation of the vehicles, and heavy fines. Generally, however, a minimal bribe of $20 to $50 can be paid, and the plants continue on their way.

Air freight is preferred by overseas shippers because it is quick and because agricultural inspections upon arrival in the U.S. are often cursory. Surface freight has advantages of its own. It is much less expensive than

air freight, thus allowing larger numbers or larger plants to be transported. Inspection at the harbors for specialized cargo such as this is often perfunctory. The plants, shipping crate and all, are fumigated in massive gas chambers, along with shipments of cotton and other products. The delay of several months often necessary for surface freight is the main drawback, but it is probably no worse for the plants than hauling them across the deserts of Mexico and the southwestern U.S.

At the border, officials of the U.S. Customs Service generally do not inspect the plants but rely on the declared number on the documents presented for determining the small customs tax. Small shipments may pass through by being declared as specimens for scientific research having no commercial value.

At least in earlier years, thoroughness of inspection of plants trucked to the U.S. ports of entry from Mexico varied depending on the APHIS inspector's workload, familiarity with trade regulations, strictness, and other factors. Generally, a USDA plant import permit was required, but if fewer than 100 plants were involved, it was not always requested. With large shipments containing thousands of plants, often only a few boxes would be examined and the plants on top inspected for insects. Shippers could time their arrival at the inspection station to coincide with the head agricultural inspector's absence. The shipper ran the risk that the plants would be impounded until the chief returned, but hoped that the official on duty would perform a cursory inspection of a few specimens and allow them to pass. This practice may explain the large numbers of CITES-protected plants that crossed U.S. borders without permits in 1979.

Some shipments avoid inspection when two or more federal agencies assert jurisdiction. If agents from Customs or a drug enforcement agency become suspicious, they immediately take over the inspection of the vehicle for contraband drugs or narcotics while the agricultural inspectors retire to the office. Once the vehicle is cleared, it can leave the station without further inspection.

Counting on incomplete inspection or inspections by port officials not versed in plant identification, shippers sometimes intentionally misidentify several taxa so as to save time or to smuggle in a specimen that could not be legally imported if it were correctly identified. McCarten has known of some species of CITES-listed cycads described by the shipper as non-CITES ferns. Numerous shipments of the rare Pachypodium namaquanum, called ghost men, have entered the U.S. intentionally misidentified as Euphorbia. Outright smuggling is also used, sometimes including plants exceeding APHIS regulation size (Gary Lyons, letter to Senator Philip A. Hart, May 3, 1976).

In the United States, requests for CITES export permit forms are becoming more frequent. Obtaining export permits from other countries may only require a letter to the proper agency, sometimes accompanied by a small fee. Occasionally, these permits can be obtained in the field at local agricultural stations, again for a small fee.

The official APHIS plant health forms require identification of plants by species, but at least in the past, shippers often failed to identify their specimens accurately or listed them simply as "cacti" or "succulents," or other similar designations. While this technically violates APHIS directions, port inspectors often let such shipments pass without further clarification, especially for very large shipments.

Once in the U.S., plants may be transported to a single nursery where they are re-established for commercial trade, or shipped "bare-root" to other nurseries, perhaps in foreign countries. Some of the large field collectors are not connected with nurseries, but travel from nursery to nursery selling out of the back of a truck or trailer. When nearly all the plants are sold, the collector returns for another load.

B. The Magnitude of Field-Collection versus Artificial Propagation.

Much of the rising demand for plants has been supplied by increases in the number and size of commercial artificial propagators. However, the growing trade in plants sought by specialists has generated pressure on wild populations, particularly for plant species difficult to propagate and grow. The proportion of collected specimens as a part of any nursery's stock may vary considerably.

Collected specimens provide certain benefits to the dealer: mature, flowering specimens may be obtained in large numbers in a relatively short time and at a relatively low cost. Possible disadvantages include mortality during collection, transportation, and re-establishment. McCarten has observed losses of collected cacti shipped from Mexico to the United States of 30-60%, and losses of some African succulents have been as high as 95%. The causes of such high mortality include poor collecting techniques, crowded shipping boxes, and fumigation.

Propagation of plants of marketable size, on the other hand, requires time, space, and expertise. To grow an orchid from seed to flowering stage can take from 5 to 50 years or more, depending on the species. Common species of cacti usually take from 3 to 8 years to mature. For insectivorous plants, propagation is not difficult, but nursery owners complain that the low cost of collection makes growing these plants unprofitable.

Information available to the authors suggests that many plants in trade, and frequently of rare species, are field-collected rather than artificially propagated. Author McCarten carried out a survey of 19 nurseries offering cacti and succulents in 1978-79 and found that many species offered appeared to be field-collected, as shown in Table 33. For example, one nursery offering 446 different taxa had 199 that were judged to be field-collected. Eight species offered are listed under the U.S Endangered Species Act (ESA). By contrast, another nursery offering 218 taxa, had only 3 taxa judged to be field-collected and offered no species listed on the ESA.

McCarten estimates that between 30% and 40% of all cactus species sold in the U.S. and abroad are usually obtained from field-collected specimens. Of the genera reported as imported into the U.K. in 1978 (U.K. CITES

Report), ten were considered to nearly always be field-collected including: Astrophytum, Aztekium, Epithelantha, Ariocarpus, Encephalocarpus, Navajoa, Neogomesia, Obregonia, Pelecyphora, and Strombocactus. Gibson estimates that up to 80% of the orchid species sold in the United States are derived in some way from field-collected specimens. Field-collected plants are divided into many parts, each of which is then established as an individual plant. Each new plant can be sold or divided again. The other 20% of orchid species are usually grown from seeds, including Disa uniflora and Paphiopedilum delenatii.

Table 33
Number of Species Offered in Cactus and Succulent Nursery Catalogues, 1978-1979.

Nursery Number	Number of Species Listed	Number of Species Judged to be Field Collected	Number of Species on the U.S. Endangered Species List
1	218	3	0
2	23	16	0
3	53	53	0
4	80	56	4
5	76	34	1
6	28	28	2
7	82	32	0
8	19	18	0
9	446	199	8
10	634	307	11
11	475	186	7
12	90	47	3
13	400	73	0
14	72	15	1
15	43	4	0
16	185	37	4
17	185	37	4
18	34	2	0
19	360	72	4

Source: Count and analysis of 19 different nursery catalogues by Niall McCarten.

References

Anderson, A. W. 1966. How we got our flowers. New York: Dover.

Arditti, Joseph. 1966. Orchids. Sci. Am. 1966(Jan.):70-80.

Arp, Gerald K. 1978. Practical problems in conservation. Am. Orch. Soc. Bull. 47(4):318-320.

Ayensu, Edward S. and Robert A. DeFilipps. 1978. Endangered and threatened plants of the United States. Washington, D.C.: The Smithsonian Institution and World Wildlife Fund-U.S.

Banks, Vic. 1980. Our cacti have met the enemy--and they are us. Smithsonian Magazine 11(9):94-103.

Benson, Lyman. 1975. Cacti, bizarre, beautiful but in danger. Nat'l Parks and Cons. Mag. 1975(July):17-21.

Bell, C. Richie. 1952. Natural hybrids in the genus Sarracenia I. History distribution, and taxonomy. J. Elisha Mitchell Sci. Soc. 68:55-80.

Beverly, Alan C. 1980. The ecological status and environment of Aloe polyphylia in Lesotho. Cac. and Succ. Soc. J. (U.S.) 52(5):216-219.

Bond, Creiva. 1978. Wild plant racketeers. African Wildlife 32(3):29-32.

Britton, N.L. and J.N. Rose. 1963. The Cactaceae. New York:Dover, 4 Volumes.

Cabrera, A. L. 1977. Threatened and endangered species in Argentina. Pages 245-247 in G. T. Prance and T. S. Elias, eds. Extinction is forever. New York: New York Botanical Garden.

Campbell, Faith Thompson. 1980. Conserving our wild plant heritage. Environment 22(9):14-20.

Campbell, Faith Thompson. and Jan Tarr. 1980a. The international trade in plants is still unregulated. Nat'l Parks and Cons. Mag. 1980(April):11-15

_____. 1980b. Plant contraband. Garden 4(6):8-11.

Castetter, E. F., P. Pierce, and K. H. Schwerin. 1976. A new cactus species and two new varieties from Northwest Mexico. Cac. and Succ. J. (U.S.) 48(2):77-82.

Crosby, Alfred W., Jr. 1972. The Colombian exchange, biological and cultural consequences of 1492. Westport, Connecticut: Greenwood Press.

de Ghillany, Anton. 1978. Sophronitis and Hadrolaelias of Brazil. Am. Orch. Soc. Bull. 47(7):77-82.

Dunsterville, G. C. K. 1968. Please don't strip the forest--even from your armchair. Am. Orch. Soc. Bull. 37(5):397-401.

Fernald, M. L. 1939. The problems of conserving rare native plants. Page 375 in Smithsonian Institution Annual Report.

Folkerts, George W. 1977 Threatened and endangered carnivorous plants of North America. Pages 301-313 in G. T. Prance and T. S. Elias, eds. Extinction is forever. New York:New York Botanical Garden.

Fiske, M. D. and W. J. Harper. 1980. Opportunities for orchid research. Am. Orch. Soc. Bull. 49(11):1262.

Fordyce, Frank. 1980. The changing face or orchid plant merchandising. Am. Orch. Soc. Bull. 48(12):1234-1236.

Fosberg, F. R. 1975. The deflowering of Hawaii. Nat'l Parks and Cons. Mag. 1975(Oct.):5-10.

Gentry, Howard Scott. 1970. Two new Agaves in Arizona. Cac. and Succ. J. (U.S.) 42(5):223-228.

Gordon, Bonnie B. 1980. Cactus rustling. Science 80 1980(Jul.-Aug.):52-59.

Hamilton, Robert M. 1970. Hamilton's hundred. Am. Orch. Soc. Bull. 1970(Feb.):133-136.

Harrington, H. A. 1980. The need for protection of our native cacti. Cactus and Succulent Journal (U.S.) 52:224-232.

Heil, Kenneth D. 1979. Three new species of cactaceae from southeastern Utah. Cac. and Succ. J. (U.S.) 51(1):25-30.

Henry, V. G. 1977. Role of Fish and Wildlife Service concerning endangered flora. U.S. Forest Service General Technical Report S.E. 11:41-51.

Hornbill, S. K. Jain and A. K. Baishya. 1977. Nepenthes khasiana, an endangered species. J. Bombay Nat. Hist. Soc. 1977(April-June):17-18.

Howard, R. A. 1977. Conservation and the endangered species of plants in the Caribbean Islands. Pages 105-114 in G. T. Prance and T. S. Elias, eds. Extinction is forever. New York:New York Botanical Garden.

Huxley, Anthony. 1974. Plant and planet. New York:The Viking Press.

International Untion for Conservation of Nature and Natural Resources. 1978. The IUCN Plant Red Data Book, Morges, Switzerland:IUCN.

Jarvis, C. E. 1978. The trade in cacti and other succulent plants in the U.K. IUCN/SSC TRAFFIC Group report., London.

Kores, Paul. 1977. Papua New Guinea's orchids: an exploited resource. Paper presented to the Papua New Guinea Botanical Society at the Wau Ecology Institute, October 23-23, 1977.

Lyons, G. 1979. The C.S.S.A. and conservation, a boom or a bust? Cac. and Succ. J. (U.S.) 51:9-15.

_____. 1976. Some new developments in conservation. Cac. and Succ. J. (U.S.) 48(4):155-162.

Martin, F. W. and R. M. Farmer. 1975. The spoilage of the breeding ground of the turks cap. Cac. and Succ. J. (U.S.) Supp. Vol.: 29-32.

McMahan, Linda. 1981a. U.S. exports and imports of cacti, 1977-1979: a presentation and analysis from U.S. Fish and Wildlife Service records and data. Washington, D.C. International Convention Advisory Commission.

_____. 1981b. Plants protected by the Convention on International Trade in Endangered Species of Wild Fauna and Flora: a list of plants reported in trade, including common names and synomyms. Washington, D.C.: International Convention Advisory Commission.

_____. 1980. Legal protection for rare plants. Am. U. Law Rev. 29(3);515-569.

Nelson, Paul V. 1978. Greenhouse operation and management. Reston, Virginia:Reston Publishing Co., Inc. (Prentice-Hall).

Pew, Thomas. 1978. In Arizona there's a cactus law, a cactus cop to enforce it, and a million dollar rustle. Horticulture 1978(Jan.):21-24.

Pizarro, C. M. 1977. Threatened and endangered species of plants in Chile. Pages 251-253 in G. T. Prance and T. S. Elias, eds. Extinction is forever. New York:New York Botanical Garden.

Rauh, Werner. 1972. The genus Pachypodium. Cac. and Succ. Soc. J. (U.S.) 44(1):7-31.

Santos, J.V., 1974. The Philippine National Botanic Garden. Pages 41-46 in B. C. Stone, ed. The role and goals of tropical botanic gardens. Penerbit Universiti, Malaya, Juala Lumpur, Malaysia.

Selkow, Paula. 1975. Carnivorous Plants. Free Enterprise Mag. Dec. issue.

Steyermark, Julian A. 1977. Future outlook for threatened and endangered species in Venezuela. Pages 128-135 in G. T. Prance and T. S. Elias, eds. Extinction is forever. New York:New York Botanical Garden.

Stone, Benjamin C. 1971. America's Asiatic flora: the plants of Guam. Am. Sci. 59:308-319.

Tarr, Jan. 1980. U.S. import/export trade in endangered cacti and succulents. Washington, D.C.:National Wildlife Federation report.

Tijmens, Wim J. 1978. A botanical octopus: Welwitschia mirabilis Hook. Aloe 16:11-18.

U.S. Fish and Wildlife Service. 1979. Draft status report on Darlingtonia californica.

Vovides, A. P. and A. Gomez-Pompa. 1977. The problems of endangered and threatened plant species of Mexico. Pages 77-88 in G. T. Prance and T. S. Elias, eds. Extinction is forever. New York:New York Botanical Garden.

Whitelock, Coran M. 1978. The twilight of the cycads. Garden 2(5):7-11.

Whittle, J. 1970. The plant hunters. London:William Heinemann.

Withner, Carl L. 1977. Threatened and endangered species of orchids. Pages 314-322 in G. T. Prance and T. S. Elias, eds. Extinction is forever. New York:New York Botanical Garden.

Yearsley, G. G. 1976. Orchidomania--a brief look. Am. Orch. Soc. Bull. 1976(Aug.):672-676.

Appendix A

The Artificial Propagation Exemption

Article VII(5) of CITES provides that where a Management Authority of the exporting country is satisfied that an Appendix II plant has been artificially propagated, it shall issue a Certificate of Artificial Propagation in lieu of an export permit. Artificially propagated specimens of Appendix I species are to be treated as if they were in Appendix II, Article VII(4), meaning that they must be accompanied only by an export or re-export permit.

At the Second Meeting of the Conference of the Parties, the Parties adopted a strict definition of artificial propagation expressed in Conference Document 2.12 (Conf. 2.12) as follows:

THE CONFERENCE OF THE PARTIES TO THE CONVENTION RECOMMENDS . . .

(c) that the term "artificially propagated" be interpreted to refer only to plants grown by man from seeds, cuttings, callus tissue, spores, or other propagules under controlled conditions. The artificially propagated stock must be:

(i) established and maintained in a manner not detrimental to the survival of the species in the wild, and

(ii) managed in a manner designed to maintain the artificially propagated stock indefinitely.

(iii) Controlled conditions for plants is under an environment that is intensively manipulated by man for the purpose of producing selected species. General characteristics of controlled conditions may include but are not limited to tillage, fertilization, weed control, irrigation, or nursery operations, such as potting, bedding, or protection from weather.

The United States implements the CITES provisions and Conf. 2.12 by issuing a "Certificate of Artificial Propagation." In the past, such certificates have been issued upon little more than a signed statement that plants were indeed artificially propagated. The U.S. Management Authority required only that applicants supply some "proof" of propagation such as a photograph of their facilities or a copy of their local nursery license. When the certificates were issued, they often allowed the plant dealers to export entire categories of plants rather than listing genera and species of plants qualifying under the exemption. For example, many certificates were issued for all "Cactaceae."

As a result of this somewhat lenient policy, few plant dealers applied for export permits, and nearly all plants exported from the United States were either certified as artificially propagated or were exported under re-export permits. In 1980, mindful of the extensive field collecting known to occur in the American Southwest, the U.S. Office of the Scientific Authority (OSA) began reviewing applications for certificates of artificial propagation in light of the knowledge as to which species are most likely to be cultivated, and which are most likely field collected.

In 1980 and 1981, the International Convention Advisory Commission (ICAC), working closely with OSA and the Wildlife Permit Office, began to work out recommendations on how to close some of the artificial propagation "loopholes" in the United States. In September, 1981, the ICAC made final recommendations to the U.S. Fish and Wildlife Service (FWS) on artificial propagation.

Part of this recommendation was for the FWS to redesign the questions asked of applicants for artificial propagation certificates. Two questionnaires were designed, one for plants native to the United States, and a shorter questionnaire for plants not native to the United States. The shortened "streamlined" form was considered more appropriate for non-native plants since parental stocks probably came from one of the following sources: (a) other nurseries or growers, (b) legal imports under the artifical propagation exemption or with a "no detriment" finding from the country of export; or (c) imports prior to the CITES listings.

To control problems of illegal routing through the United States, the ICAC recommended that OSA prepare a list of exotic plants "of special concern." For these plants, the more detailed questionnaire would be used. Factors triggering inclusion on such a list might include (a) knowledge that the plants are difficult to propagate or maintain in cultivation, (b) identification by the native country that the plants are of special concern, and (c) information supplied by enforcement personnel that field-collected plants are consistently misrepresented as artificially propagated.

Copies of the two questionnaires recommended for use are included at the end of this Appendix.

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

logo

Instruction Sheet. Questionnaire for Export of Artificially Propagated Plants Numbers 1 & 2.

General Instructions

Do not use this questionnaire for Panax quinquefolius, American ginseng.

Use these instructions to fill out either of the two questionnaires for artificially propagated plants. Use the more detailed questionnaire, Number 1, to apply for export of:

- plants native to the United States or its territories.
- plants not native to the United States that are listed on the attached sheet (OSA will develop this list).

Use questionnaire Number 2 for all other artificially propagated plants.

DRAFT

If you did not artificially propagate the plants you are applying to export, please obtain the requested information from whoever did. If you cannot obtain the information, please attach a separate sheet explaining why you cannot obtain it.

Following are the instructions for use with **questionnaire number 1.**

Question 1

You may use this form for up to three different species as long as all of the answers apply to each one of these species. Please use a different set of boxes for each artificially propagated "species" you want to export. "Species" in this case, means any subspecies, variety, form, cultivar, or hybrid. You should, for example, use two sets of boxes for two subspecies of one species.

Scientific Name

Fill in the complete scientific name of the plant you want to export. This includes any applicable subspecies or variety names.

Names of Hybrids

For hybrids, follow the rules set out in Appendix I of the International Code of Botanical Nomenclature as follows.

A hybrid of two species of the same genus is designated by using a multiplication sign (x) before the "species" name. An example is Salix xcapreola, which is a cross between Salix aurita and Salix caprea (otherwise designated as Salix aurita x S. caprea).

You should designate a hybrid of two different genera by the using the registered hybrid genus prefaced by the multiplication sign. For example, the orchid genus xGymnoglossum is the recognized name for Coeloglossum x Gymnadenia. Follow the hybrid genus name by the appropriate species name.

In cases where you do not know the registered name or cases where the name is not officially registered, please provide the complete scientific names of the parents.

Common Names

Provide any known common names for this species.

Kind of Specimens

Please specify in this column whether the specimens you want to export are individual plants, cuttings, bulbs, pseudobulbs, corms, rhizomes, roots, or tubers. If you are applying to export flasks or vials of seedlings or of tissue cultures, use a phrase such as "vials of seedlings." If you are applying to export a plant product, please specify the type of product (e.g. cactus candy). For any other kind of specimen, please specify the exact part or product you want to export.

DRAFT

Number of Specimens

If you are applying to export **individual plants**, or **plant propagules** such as cuttings, bulbs, pseudobulbs, corms, rhizomes, plant offshoots, roots or tubers, please give the number of specimens you are exporting.

If you are applying to export **seeds**, spores, or a **plant product** (such as powder made from a root), please give the number of pounds and ounces or kilograms, grams or milligrams. Make sure that you specify what units you are using.

please see the other side of the page for more instructions.

If you are applying to export flasks or vials of seedlings, or tissue cultures, please specify the number of flasks or vials and not the number of seedlings or tissue cultures.

Question 2

If you check "yes" in question 2, please attach a copy of your state nursery certificate.

Questions 3 through 4

No special instructions.

DRAFT

Question 5

Question 5 refers to the plants you used to artificially propagate the specimens you want to export. For example, if you grafted plant offshoots from a plant that was, itself, artificially propagated, then you would check "c." If you made cuttings off of a plant growing in the wild and then grew the specimens you want to export from these cuttings, check "a." If you want to export plants grown from seeds that were collected in the wild, check "a." If none of these situations covers the way that you grew the plants you want to export, check "d" (other) and specify how you grew them. If you did not grow the plants, obtain this information from whoever did.

Questions 6 through 8

No special instructions.

Questions 9 through 14

Answer these questions only if you checked "yes" in question 8, signifying that wild material has been added to the artificially propagated stock during the last five years.

Instructions for Questionnaire Number 2.

Questionnaire Number 2 is a streamlined questionnaire especially designed for artificially propagated plants that are not native to the United States or for artificially propagated hybrid plants. If any parents were derived from Appendix I plants (see enclosed list), then you must fill out Questionnaire Number 1.

Many of the instructions for Questionnaire Number 1 also apply to this streamlined questionnaire. Please read the instructions under "Question 1" on the other side of this page and apply these instructions to the appropriate columns on Questionnaire Number 2.

The front and back of Questionnaire Number 2 contain spaces for eleven (11) different species. If you are applying for more than eleven different species, make as many copies of the "Attachment Sheet" as you need.

Method of Propagation

Fill in this column with a word or short phrase indicating how you propagate each species. Methods include cuttings, grafting offsets, plant offsets, seeds, etc.

DRAFT

Number

Follow the instructions for "Number of Specimens" on the other side of this page.

Supplier

If you grew the specimens yourself, write "self" in this column. If you did not grow them, write in the name and address of your supplier.

If you develop or acquire new hybrids during the period any Certificate of Artificial Propagation is in force, you may add the names(s) directly to the export document following the same rules outlined in the instruction sheet.

BEST AVAIL

Questionnaire for Export of Artificially Propagated Plants Number 1.
(Attachment to Form 3-200)
Use for: o **Native Plants**
o **Exotic (non-native) plants listed in the Instructions**

Name of Applicant: _____ Date: _____

1. Which species of plant(s) do you want to export? (see instructions to fill in this information).

	Plant Name(s)	Kind of Specimen(s)	Number of Specimen(s)	Range in Height	Range in Age
a.	Scientific Name: Common Name(s):				
b.	Scientific Name: Common Name(s):				
c.	Scientific Name: Common Name(s):				

DRAFT
DRAFT

2. Did you grow these plants?

☐ Yes (attach a copy of your state nursery certificate and skip question 3)

☐ No

3. If you did not grow these plants, who did?

Name: _____

Address: _____

_____

_____

4. How did you or your supplier grow these specimens? (check one)

a. from seeds or spores ☐

b. from callus tissue culture, meristem culture or other culture methods ☐

c. from bulbs, pseudobulbs, cuttings, plant offshoots, or other plant propagules ☐

d. from wild-collected plants ☐

e. by grafting individual plants or plant offsets ☐

e. other (specify)_____ ☐

_____

See the other side of the page for more questions

ABLE COPY

5. What kind of plant(s) gave rise to the specimens you want to export? (see instructions and check one)

a. plants collected directly from wild populations or wild plants that have been maintained in cultivation for less than one year ☐

b. plants collected from the wild that have been maintained in cultivation for more than one year ☐

c. plants grown from seeds, spores, or other propagating material entirely under greenhouse conditions or under comparably controlled conditions ☐

d. other (specify)_____ ☐

_____

6. Under which of the following conditions did you or your supplier grow the plants you want to export? (check one)

greenhouse ☐ growth chambers ☐

open field ☐ covered nursery beds ☐

other(specify)_____ ☐

7. Which of the following operations did you use to grow the plants listed in this questionnaire? (check all that apply)

grew them in pots ☐ fertilized them ☐

grew them in rows ☐ watered them artificially ☐

protected them from the weather ☐ used pesticides or other pest control measures ☐

tilled or cultivated the soil ☐ used herbicides or other weed control measures ☐

8. Within the last five years, has any wild material been added to the plant stock?

☐ Yes (answer questions 9 through 14)

☐ No (you have completed this form; do not answer the remaining questions)

9. In what form was the wild material added to the cultivated plant stock? (check all that apply)

pollen ☐ seeds or spores ☐

cuttings or plant offshoots ☐ bulbs, pseudobulbs, corms or rhizomes ☐

individual plants ☐ roots or tubers ☐

other (specify)_____ ☐

10. How often is wild material added to the plant stock?

_____

11. From which Country (Countries), State(s), and County (Counties) or other suitable subdivisions was the wild plant material collected?

_____

_____

_____

DRAFT

12. For each species, approximately how many wild plants were collected or used to supply plant propagules?

_____

_____

_____

13. Briefly explain why the wild material was added to the breeding stock. (attach a separate sheet if you need more room)

_____

_____

_____

14. Explain why you obtained material collected from the wild instead of using material from commercial or non-commercial sources offering artificially propagated plants. (attach a separate sheet if you need more room)

_____

_____

_____

DRAFT

BEST AVAILABLE COPY

Questionnaire for Export of Artificially Propagated Plants Number 2 (Attachment to Form 3-200)

Use for:
- o Artificially Propagated Hybrids not having Appendix I Parentage
- o Exotic (non-native) Appendix II Plants that are Artificially Propagated

Name of Applicant: _____ Date: _____

Which artificially propagated plant species do you want to export? (see instructions).

Plant Name	Method of Propagation	Kind of Specimens	Number	Supplier
scientific name - common name(s)				
scientific name - common name(s)				
scientific name - common name(s)				
scientific name - common name(s)				
scientific name - common name(s)				

DRAFT

See Other Side for More Space

Plant Name	Method of Propagation	Kind of Specimens	Number	Supplier
scientific name common name(s)				
scientific name common name(s)				
scientific name common name(s)				
scientific name common name(s)				
scientific name common name(s)				
scientific name common name(s)				

DRAFT

DRAFT

Use Attachment Sheet(s) for More Space

Questionnaire for Export of Artificially Propagated Plants Number 2 - Attachment Sheet

Use As Many Copies of this Attachment Sheet as you Need

Name of Applicant: _____ Date: _____

Plant Name	Method of Propagation	Kind of Specimens	Number	Supplier
scientific name - - - - - - - - - - - - - - - - - - common name(s)				
scientific name - - - - - - - - - - - - - - - - - - common name(s)				
scientific name - - - - - - - - - - - - - - - - - - common name(s)				
scientific name - - - - - - - - - - - - - - - - - - common name(s)				
scientific name - - - - - - - - - - - - - - - - - - common name(s)				

DRAFT

Appendix B

List of Major Plant Societies Worldwide

Cacti and Succulents

Cactus and Succulent Soceity of America (USA; includes 65 affiliates)
Deutsche Kakteen-Gesellschaft
National Cactus and Succulent Society (GB)
Cactus and Succulent Society of Great Britain
South African Aloe and Succulent Society
Aloe, Cactus, and Succulent Society of Rhodesia
International Cactus and Succulent Society (Texas)
La Sociedad Mexicana de Cactologia, AC
Epiphyllum Society of America
Cactus and Succulent Exchange (Canada)
Mamillaria Society (GB)
Cactus and Succulent Society of New South Wales
Cactus and Succulent Society of South Australia
Association Francaise des Amateurs de Cactees
Desert Plant Society of Japan
Semperivivum Society
Central Coordinatring Committee of Cactus-Lovers (USSR)
Cactus and Succulent Society of Israel
Cactus and Succulent Society of Austria
Associazonione Italiana Amatori delle Pinate Succulents (AIAS)

Orchids

American Orchid Society (includes 200 affiliates)
Duetsche Orchideen Gesellschaft
Society Francaise d'Orchidophile
Orchid Society of South East Asia
Orchid Society of Great Britain
Scottish Orchid Society
Australian Orchid Council
Osterreichishe Orchideen-Gesellschaft
Orchid Society of Bahamas
Barbados Orchid Circle
Sociedade Brasileira do Orquidofilos
Bruinei State Orchid Society
Orchid Circle of Ceylon
Sociedad Colombiana de Orquideologia
Club de Orchideenfreunde in Prag
Dansk Orchide Club
Sociedad Dominicana de Orquideologia
Asociacion Ecuatoriana de Orquideologia
Asociacion Salvadorene de Orquideologia
Asociacion Gratemalteca de orquideologia
Guyana Orchid Society
Socieded Hondurena de Orquideologia
Hong Kong Orchid Society
Orchid Club of Bombay (India)
Orchid Society of Papua New Guinea
Orchid Society of Haiti
Hawaiian Orchid Societies
Nederlandse Orchideen Vereniging
Associazione Italiana per la Orchidee
Jamaica Orchid Society
Japan Orchid Society
Kenya Orchid Society
Sociedad Orquidofile de Guadalajara
New Zealand Orchid Society
Orchid Society of Peru
Philippine Orchid Society
Rodesian Orchid Society
South African Orchid Council
Orchid Club of Stockholm
Schweizerische Orchideengesellschaft
Taiwan Orchid Society
Orchid Society of Thailand
Trinidad Orchid Society
British Orchid Council

Orchids, continued

International Phalenopsis Society of America
Cymbidium Society of America
Socieded de Orquideologia de Carabobo
Guam Orchid Society
Puerto Rico Orchid Society
Ponce Orchid Society
Austraian Native Orchid Society
Darwin Orchid Society of the Northern Territory
Gold Coast Orchid Society (Australia)
Orchid Species Society (Australia)
Queensland Orchid Society
South Australia Orchidaceous Society
Tasmanian Orchid Society
Orchid Society of Western Australia
Nucleo de Orquidofilos de Casa Branca (Brazil)
Orchid Society of Alberta
Vancouver Orchid Society
Manitoba Orchid Society
Southern Ontario Orchid Society
Eastern Canada Orchid Society
Asociacion Costarricense de Orquideologia
Okinawa Orchid Society
Los Banos Orchid Society (Phillippines)
Nanyand Orchid Association (Singapore)
Orchid Club of Venezuela
Cape Orchid Society (S. Africa)
Natal Orchid Society
Transvaal Orchid Society

Insectivorous Plants

Carnivorous Plant Newsletter (USA)
Carnicorous Plant Newsletter (Australia)
Carnivorous Plant Society (UK)
Insectivorous Plant Society of Japan
Insectivorous Plant Society of Nagoya
Potomic Valley Carnivorous Plant Society (USA)

Ferns, Cycads, and Palms

Cycad Society
Palm Society
Los Angeles International Fern Society
British Pteridological Society
American Fern Society
Japanese Pteridological Society
International Tropical Fern Society (Miami)
Nippon Fernist Club
Nelson, New Zealand, Fern Society
South Florida Fern Society

Bromeliads

Bromeliad Society, Inc.
Deutsche Bromelien Gesellschaft

Rock Garden Plants

American Rock Garden Society
Scottish Rock Garden Club
Alpine Rock Garden Society (UK)
Societe des Amateurs de Jardins Alpins
Canterbury Alpine Garden Society
Vancouver Island Rock and Alpine Garden Society
Alpine Club of British Columbia

House and Garden Plants

North American Lily Society
American Lily Society
American Iris Society
British Iris Society
National Fuchia Society
American Fuchia Society
American Gloxinia and Gesneriad Society
American Gesneria Society

House and Garden Plants, continued

Gesneriad Society International
African Violet Society of America, Inc.
Saintpaulia International
American Daffodil Society
American Rhododendron Society
American Gourd Society
American Hemerocallis Society
American Delphinium Society
American Hibiscus Society
American Hosta Society
American Penstamon Society
American Primrose Society
National Auricula and Primula Society (UK)
Herb Society of America
Bonsai Clubs International
Holly Society of America
International Geranium Society
American Begonia Society
American Boxwood Society
American Camellia Society
American Ivy Society
National Chrysanthemum Society
National Oleander Society
American Magnolia Society
American Poinsettia Society
International Aroid Society
American Rose Society

Horticultural Plants

American Horticultural Society
Massachusetts Horticultural Society
Pennsylvania Horticultural Society
California Horticultural Society
Botanical Society of Japan
Botanical Society of South Africa
Royal Horticultural Society
Philippine Horticultural Society
La Societe Nationale d'Horticulture de France

Miscellaneous

American Plant Life Society
Indoor Light Garden Society of American
California Rare Fruit Growers
Strybing Arboretum Society

Appendix C

Authors' Note

Niall McCarten has nearly five years of direct experience with the wholesale and retail nursery trade in cacti and succulents, including two years of commercial cactus collecting from wild populations in Mexico and the Southwestern United States. He has also conducted nearly eight years of field studies of cacti for scientific research in the same areas. In late 1974, Mr. McCarten travelled to Great Britain and Europe, where he visited commercial and private nurseries and authorities on cactus and succulent plants. He spent three months in Kenya in early 1975 studying the regional succulents and visiting local botanical specialists. In 1980 and 1981, Mr. McCarten was in a graduate research program in the Department of Ecology and Evolutionary Biology, Univeristy of California, Irvine, California. His research focused on population dynamics of cacti with respect to the highly specialized adaptations to their arid environments. He is most interested in aspects such as age structuring, seed production and dispersal, and how these factors, together with field collecting, affect the survival and population structure of rare cacti and succulents.

Thomas C. Gibson is currently completing a Ph.D. in ecology and evolutionary biology from the University of Arizona. His major research interest is island biogeographic theory, and he describes himself as a "community ecologist." He is particularly interested in the nature of stochastic extinction process for plants and application of general principles from evolutionary ecology to optimal design and management of plant preserves. Prior to attending graduate school, Mr. Gibson travelled to Europe, Mexico, Malaysia, New Guinea, and elsewhere to study and orchids, cycads, and insectivorous plants.

Faith Thompson Campbell holds a Ph.D. in political science from Princeton University. As a Research Associate for the International Project of the Natural Resources Defense Council (NRDC), she has specialized on CITES-related issues over the last four years. Since 1978, Dr. Campbell has worked with government agencies and the Congress to improve U.S. regulation of both the international and domestic trade in rare plants. For this effort, she received the Natural Resources Council of America's Award of Achievement in February, 1981. Dr. Campbell has published numerous articles on rare plant conservation in environmental and horticultural magazines.

Linda McMahan holds a Ph.D. in botany from The University of Texas at Austin where she worked on the biochemistry of betalains, the red and yellow pigments found in the Cactaceae and in other related families. In December, 1981, she will also complete a J.D. from the Washington College of Law, at the American University, Washington, D.C. Dr. McMahan was Assistant Professor of Biology at Utica College of Syracuse University from 1972-1976. From 1978 to September, 1981, she worked for the U.S. Government, first at the Environmental Protection Agency, and then as staff botanist for the International Convention Advisory Commission.

Dr. McMahan has published the only available analysis of rare plant conservation laws of the United States. While at the Commission, she prepared several reports on the plant trade. Dr. McMahan is currently working under contract with TRAFFIC (USA).

Susan Edwards prepared the artwork for this report. Ms. Edwards resides in Tucson, Arizona, where she is a free lance artist. She holds a B.S. in zoology from Humboldt State University, Arcata California, with a special emphasis in marine biology. Ms. Edward has also received several semesters of training in scientific illustration, drawing techniques, and design. Ms. Edwards has recently completed a similar drawings for use in a series of pamphlets on rare plant conservation, soon to be available through the Natural Resources Defense Council, 1725 I St., N.W., Washington, D.C. 20006.